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Editor Second Part.

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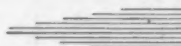
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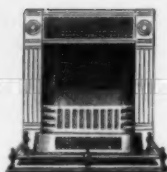
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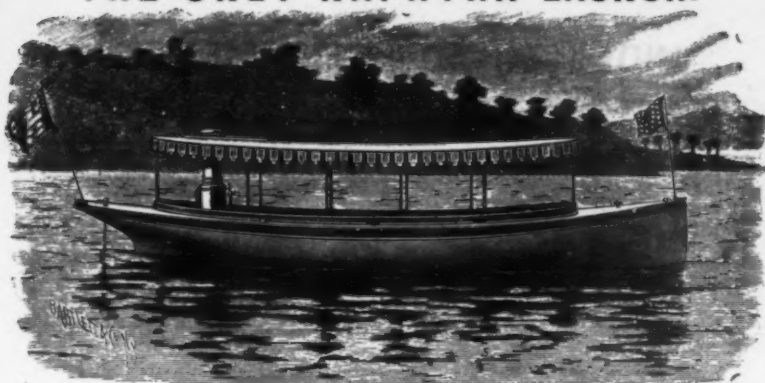
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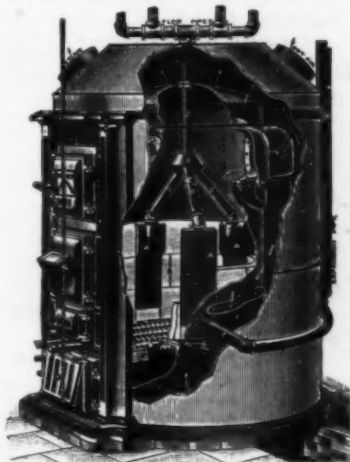
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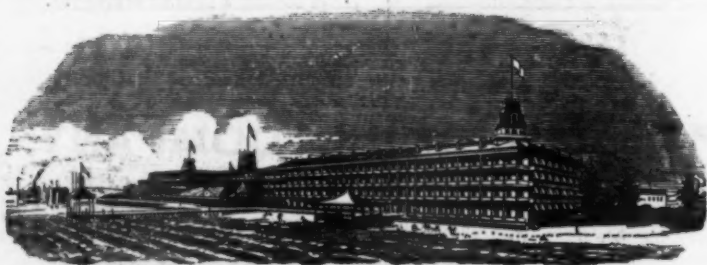
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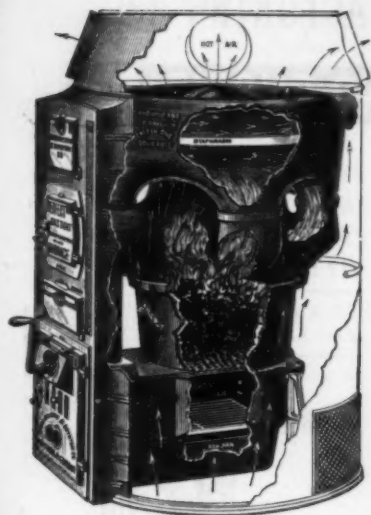
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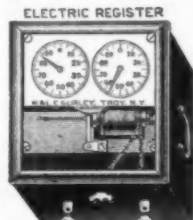
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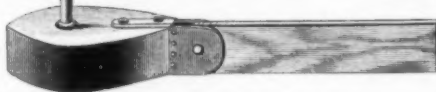
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DR. HANS VON BÜLOW.
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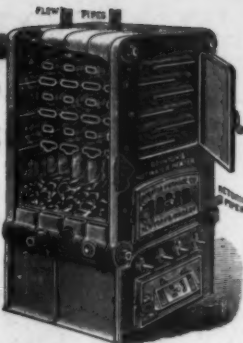
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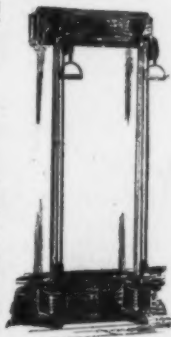
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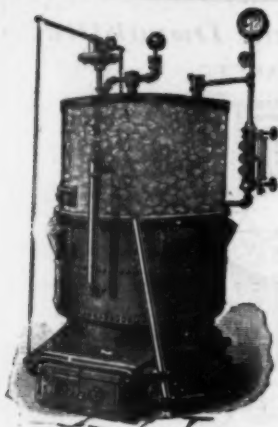
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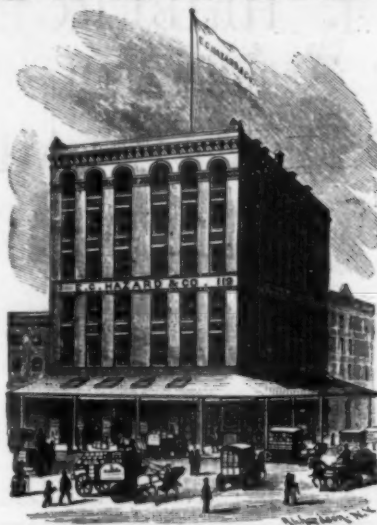
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VOL. XIII.

MARCH, 1892.

NO. LVI.

THE POSITION-FINDING AND POSITION-DESIGNATING SERVICE IN SEA-COAST DEFENSES.

BY CAPTAIN JAMES CHESTER, 3D U. S. ARTILLERY.

THE equipment of a group of sea-coast batteries for efficient position-finding is a question of prime importance, and has been very much in the air of late in all artillery circles. Many schemes have been proposed and discussed, and some have been approved and partially adopted. Many of these schemes had merit; most of them had plausibility; but none of them had completeness. They were, as a rule, crude, imperfect and unpractical children of theory. They assumed that the enemy was bound to be a fool, a chivalric idiot, who would throw no obstacles in the way of our position-finding staff. Now such an assumption must always be a very uncertain foundation to build upon. It is madness to assume that our enemy will do as we desire. His problem is the opposite of ours, and he has the advantage of the initiative. He can fight us, or he can let us alone. If he fights it is because he sees a chance to win. We may have heavier guns than he has, and more of them, but he knows it and has given it due consideration in his plan. He knows the advantages of *terra firma* for range-finding and gun-laying, and has discounted them in advance. He cannot fight shore-batteries of equal power, at long range, with any hope of success. He will therefore try to force the fighting at close

quarters. He will try to reach a position from which all his guns will be effective. That position will probably be inside a thousand yards. To reach it he must traverse an extensive danger zone. He will try to cross that zone with as little loss as possible. If concealment will lessen his danger he will try concealment. If darkness will do it, he will advance in the night. If anything will disappoint our position-finders and disconcert our gunners, anything will be attempted. He is not restricted to any particular plan. He may use his search-lights as they did at Milford Haven; or he may wrap himself in smoke as they did at the entrance to the Solent. Whatever he decides to do is sure to be a surprise to us, and a disadvantage. It is his solution of the problem we have created. He is not rushing blindly against our defenses. The chances are, he knows what he is doing.

The assailant is sure to have the advantage. He can study the problem and work out the solution at his leisure. He can organize his attack in accordance with a specific plan, and focus his whole force in the direction of his purpose. The defender cannot do that. He can have no specific plan, but must be prepared for all emergencies. The assailant can concentrate his energy. The defender must distribute his.

A modern fleet is a very wonderful machine. It has resources unknown to the old navy. Every ship is an arsenal; an observatory; a physical laboratory; a floating fortress. It carries fighting men, and thinking men, and working men, and science is a slave in all its departments. The very latest discoveries are apt to be there. All that we know of; much that we never heard of; some things that we deemed impracticable, and others that we thought impossible, are all there—just as likely as not—in active and orderly operation. It is independent of wind and tide; can travel in the darkest night and play the cuttle fish in the clearest day. It is the great chameleon of war; a thing of various shapes and hues; a monster of many ways and means.

To meet such a monster is the *raison d'être* of our professional existence. We must be prepared for him in whatever form he comes. He may assail us with electric lights or hide himself in smoke, but we must diagnose his whereabouts all the same. Position-finding is no easy art which any one may learn. It does not altogether depend on instruments and observation, or even upon brains. It is a spiritual operation at times, a kind of diagnosis by intuition. A general is a position-finder of this descrip-

tion when he determines, intuitively, the position and movements of an invisible adversary. Position-finding may be entrusted to scouts or spies, or base end observers. But when they fail, the commandant must act. Position-finding is a function of command.

Position-finding then, when considered in its entirety, contains the very key-stone of the arch of defense. Every artillery commander should be a position-finder. He may have assistants in the simpler departments of this art, but in the higher branches, where judgment must decide, the commander alone can act. The enemy may make observation impossible, he may drive in our scouts and effectually conceal his movements during an advance, but he still has the commandant to deal with. With his knowledge of the channel, and perfect control of the machinery of defense, the advance of even a hidden adversary need not necessarily be a walk over. There are points in the channel which he must pass on a comparatively narrow front, and there are moments when a concentrated fire on these points would be fatal to him. The commandant must decide when these moments arrive. For the time being his judgment is the only possible position-finder, and no rules can be prescribed for his guidance. Such a situation, and it is by no means impossible, or even unlikely, illustrates what has been called the chances of war. If the commandant judges correctly, and is successful, he is called a great commander. If he misjudges and fails he is condemned. He may be brave and accomplished, but he is a poor position-finder and therefore a failure.

Position-finding of the highest order bears the same relation to the artillery defense of a sea-coast position that strategy does to the art of war. Its functions can be defined but its methods are transcendental. The possibility of studying such an occult science then may well be doubted. Great artillery commanders must be born to the business. Still there are many things which can be learned that would help the born commander in his position-finding functions. He should have a thorough knowledge of every ship of war which might become an enemy. If possible this knowledge should be objective. He should be able to recognize them at sight. Then he should be a reader of men, and he must give free play to his powers in that direction. It is a great advantage to know an adversary, not merely to be acquainted with him, but to have looked into the very soul of him, and to be

able to tell how he will reason upon facts, and consequently how he will act. It is a great mistake to underestimate an adversary. Great men are not always brilliant. The most dangerous adversary is often reputed dull, and the most cunning always seems the simplest. The study of possible foes then is an indispensable prerequisite to intuitive position-finding.

The deerstalker furnishes an admirable illustration of what I mean in this connection. He has studied the habits, actions and instinctive impulses of his quarry so carefully, that he is able to foretell, with close approximation to accuracy, what the animal will do under any given set of circumstances. And there are commanders who seem to be endowed with prophetic powers in relation to their adversaries. They can foretell, almost with absolute accuracy, what their enemy will do under certain conditions. And then they create the conditions. It is a great mistake to hide everything from an enemy in sea-coast defense. He might be permitted even to find out something very important about the defenses, with great advantage to the defender. But it requires an artist to prepare the exhibition. The assailant must neither doubt the genuineness of his discovery nor dream that the defender knows that he knows it. In this way the defender gets the key-note of his adversary's plan. He knows the controlling fact, and like the deerstalker, can prognosticate his actions. Napoleon practically commanded both sides at Austerlitz in this way. This is the spiritual or intellectual contest between the commanders which precedes the actual battle, and the ability to foretell an adversary's actions is the highest kind of position-finding art.

But it will be said that all this is beyond the province of position-finding, and if we restrict ourselves to the accepted meaning, perhaps it is. The difficulty of dealing with the subject in a comprehensive manner grows out of the accepted meaning. If the art of position-finding in sea-coast defense be only another name for the art of triangulation, then the accepted meaning is right and we have misunderstood the subject. If, however, the art of position-finding means the art of telling where an enemy actually is at any moment while he is within range, our conceptions of it are correct. Should we treat the subject according to accepted ideas, the resulting system would rest on a foundation of sand. Should we insist upon our own definition the problem becomes insolvable. Should we try to strike the happy mean the resulting system

would be limited in its application. We approach the subject, therefore, sadly handicapped with conditions. It would be foolishness to attack an insolvable problem, and it would be uncandid to ignore the higher branches of the art. If we must restrict ourselves to the accepted meaning, we do so under protest. It is never wise to organize disappointment, and any system growing out of accepted ideas must end in disappointment. There is always danger in overestimating the applicability of any system. There are exceptions to every rule. But when the exceptions outnumber the examples the rule is not worth much. In this case there are three possibilities. Our enemy may come in a cloud of smoke and observation would be impossible. He may come at night and dazzle our observers with his electric lights, and observation would be imperfect. Or he may come like a lamb to the slaughter, all bare and exposed to observation and attack. So out of three possibilities two are exceptions.

There is only one case out of three then, and that the least likely to occur, when position-finding by observation would be possible. The other two belong to the higher branches of the art. This looks like a condemnation of the whole system, but it is not. The system would be worth maintaining for use against reconnoitring boats alone. And indeed that is most likely to prove the field of its greatest usefulness. But it has other uses. Much of its machinery is indispensable even if it never took a range. It is an essential adjunct to the defenses of every sea-coast position. We proceed therefore to the consideration of position-finding in a group of sea-coast batteries, with the distinct understanding that we are dealing with the smallest and least useful portion of the art.

The position-finding service in a group of batteries may be divided into two sections: *First*, the position-finding section which deals with observation of the enemy, transmission of results to a central station, and plotting the position. And *second*, the position-designating section which advertises the enemy's position to captains of batteries.

The first section consists of triangulators who obtain their data by azimuth observations at the ends of a measured base, or altitude observations taken at a single station of known height above the horizontal plane containing the object, and plot the enemy's position, either on a plotting board or automatically. In either case the object must be visible.

Now, there can be no doubt as to the accuracy of the method by azimuth observations. If the base be of proper length and its measurement and the observations and plotting have been correctly done, the result must be correct. The altitude method however can never be wholly reliable. The rise and fall of the tide would be sufficient to vitiate the results, however accurate the observations. Of course corrections for the tide might be introduced, but that would destroy the simplicity of the method, which is its chief recommendation.

That the error due to tide is not altogether insignificant becomes apparent the moment we appeal to figures. Assuming that the instrument is 300 feet above mean low water, and that the tide rises 6 feet. If the observed angle of depression is $89^{\circ} 05' 50''$, the object might be either 6473 or 6346 yards away; a difference of 127 yards, or about one-fiftieth of the range. Such an error is altogether inadmissible in scientific measurement. Then again spring and neap tides would be another source of inaccuracy, impossible to deal with by any general rule for tide corrections. Moreover, accurate observations by this method would be exceedingly difficult, and at very long ranges impossible. We are therefore compelled to admit that the advantages of this method are more than counterbalanced by its defects.

We are not unmindful of the fact that the famous Watkins range-finder adopted by the English for use in their sea-coast forts is of this character. It is a depression range-finder in which the variations of its vertical base due to the tide are determined from time to time by observation. The instrument is adjusted for datum distance. The telescope is then directed accurately upon the adjusting mark, which is permanently established at datum distance, and the exact height of the instrument above sea level at that moment is indicated on the cylinder. The instrument is then adjusted for the correct vertical base thus found, and is ready for use. Of course the adjustment must be repeated from time to time.

The Watkins sea-coast range-finder is, perhaps, the best of its kind, and may give fairly accurate results up to a certain distance; but the difficulties of observation at long ranges, the sphericity of the earth, and the impossibility of making accurate adjustments for minute changes in the vertical base, are sources of error which must greatly lessen its usefulness.

But our subject is not position-finding instruments, but the

position-finding service. It is to be hoped that at no very distant day, an artillery garrison arriving at a fort for duty, will find it not only a complete work, completely armed, but also completely equipped in all its departments, and can therefore direct its attention to its legitimate duties, namely, the manipulation of the machine.

But that day has not yet arrived. Not only are our forts incomplete but their armament and equipment are incomplete, and in some cases non-existent. We have not, even in theory, a complete range-finding system. We have made a beginning. A system has been outlined,—an azimuth system—and it is not likely to be changed. Perhaps it would be unwise to change it. It is always easier to amend than to create. We may therefore assume that the azimuth method has come to stay. Although it has no real established existence at any of our forts, not even at Fort Monroe, it has got recognition in orders, and in the appropriations. It is crude and imperfect, but it can be amended. Growth is a characteristic of every healthy organism, and pruning is often essential to proper growth. Let us see what we have got in the way of position-finding machinery. The position-finding service must conform to existing conditions whether we like them or not.

Since what may be called the revival of artillery science two things have operated in our army to divert artillery thoughts into false channels. First, the gun mania, and second, Prince Hohenlohe's letters. The gun mania seized upon our most brilliant men and led them captive where it would. Think of the 20" gun theory of harbor defense. The gun mania is at least partly to blame for the undeveloped condition of our position-finding machinery and service. Indeed there is so much important artillery work neglected, while promising artillerymen carry their talents into other departments, that one almost despairs of the artillery future. Why bother about gun-making, which is not our business, while position-finding machinery and service—which is our business—are entirely neglected. Then Prince Hohenlohe's teaching, most of which is excellent, has captivated the minds of many and led them off on false scents. Hohenlohe's letters were not addressed to sea-coast artillerymen. Important artillery work is neglected, not because there is no talent and no professional zeal in the artillery, but because artillery talent has been misdirected. Our artillery garrisons are unorganized, and our

batteries and forts are unequipped, and we are without any semblance of a fighting organization in any of our sea-coast defenses, because our ablest men have turned their attention elsewhere. This is to be regretted on general principles. That it is no chimaera is demonstrated by the fact that in dealing with our present subject we find it necessary to enquire "What is the accepted system of position-finding in the United States?"

This question is more easily asked than answered. Our sea-coast defense is as yet without system in any of its departments. We have to create a system. We have no foundation to build upon, no germ to cultivate, no example to follow. We have a very imperfect machine placed in our hands with which to do very important work. We have been looking at it earnestly of late, and find much to condemn and nothing to praise. We found no fighting organization in any of our sea-coast forts. We found a germ of disaster in the absence of all adequate arrangements for ammunition service, a defect which we are forbidden to correct. And now we turn our attention to the position-finding and kindred services, intended to increase the accuracy and facilitate the concentration of fire, and find no permanent machinery for that kind of work in any of our forts. There are no protected base end stations, no conning stations, no search light towers, telegraph lines, electric firing wires or telephones in any of our sea-coast works. They are not in the text books and therefore they are not there. Instead of permanent arrangements we find make-shifts, wires suspended on poles, base end stations covered with wooden sheds, conning stations similarly protected, paper charts of the harbor and so on. All shams, unfit for real work, but as much perhaps as the artillery are permitted to do. They would all be swept out of existence in a few minutes if the work was in action. Such preparations, while creditable to the artillery, are worse than worthless. They contain the seeds of demoralization.

That last remark may seem somewhat startling, but it is true. What is it that causes defeat in battle? We know how the laity would answer, but we desire to hear from professional men. No one who has witnessed the beginning of disaster, the first symptoms of panic in an organization, will be likely to claim that the killed and wounded sufficiently account for it. Organizations have become demoralized without losing a man. There is something on the battle-field more potent than bullets and steel.

There is no one so willing to believe that "the battle is the Lord's" as the soldier who has been there with a beaten army, and no one, perhaps, so hard to convince of it, as the soldier who has not had that experience.

Demoralization proceeds from two distinct fountains, the head and the heart. The first is rational, the second mysterious. The first can be prevented, the second is beyond human control. The soldier who is getting ready to run reasons in this way: The enemy are two to one against us. His arms are better than ours, our commanders are no good. I am not morally bound to remain here at such disadvantage. I have duties at home which are incompatible with a wooden leg, and, under the circumstances, I ought not to run any risk. This is rational demoralization and can be prevented by preparation, discipline and training. But panic comes from the heart, and is of the nature of cowardice. It is often temporary but always unmanageable. It is a kind of disease, and brave men are not always exempt from it.

It is curious to note that the Hebrews recognized these two kinds of timidity, and made provision for them in their laws—see the twentieth chapter of Deuteronomy. They put no cowards into line, nor any men that had a hankering after home, a young wife, or a newly planted vineyard, or anything of that sort. They were all sent home before the battle began. The law virtually declared that it was better to go into battle short-handed than to carry there the seeds of panic and disaster. And the law was right. The most potent factors in an army are the hearts and minds of the men.

Discipline is powerful, but it cannot drive a handicapped army into action. What was it that drove the garrisons of Forts Walker and Beauregard from their guns. Not the slaughter. That was not excessive, only eleven killed in the two works. But they became rationally demoralized. After a five hours' test, they learned that "somebody had blundered." Seven 10" Columbiads were not enough. They could make no impression on the Union fleet. They realized the futility of further effort, and they left. Their defeat was organized with the defenses, and was inevitable as the decrees of fate.

Our sea-coast garrisons to-day are in a situation somewhat similar to that of Fort Walker. They have a machine placed in their hands, which some one who claims to know says is equal to the work required of it. We have found it to be defective in

many of its departments. Should we go into action with it in its present condition, the result would be as it was at Fort Walker.

That position-finding has received any consideration at all in our service, is due to the craze for long-range firing, and probably had its origin on the rifle-range. There was considerable activity on the subject at one time in artillery circles. We all remember the blue-print period. The records of it are stowed away at headquarters, and, some day, may be brought forward as evidence that insanity, in an epidemic form, prevailed among artillery officers toward the close of the nineteenth century. We do not propose to call it up at present to any great extent. But there was one idea which we inherited from that period, and which still remains with us, which demands attention. We refer to the system of position-designation by squares, and the corresponding method of laying guns by common azimuths and prescribed elevations.

Those methods were approved, and orders were issued to carry them into effect. Our sea-coast garrisons went to work under these orders with something like enthusiasm. Surveys were made and charts were prepared and duly divided into squares which were designated by marginal letters and numbers after the manner of latitude and longitude designations. Copies of these charts were filed at Division Headquarters, and there the matter rests. Why? Simply because the method adopted was purely theoretical, and, as is generally the case, practically impossible.

The scheme as adopted was plausible enough. It contemplated a chart of the harbor divided into squares, the traverse circles graduated to a common zero point—the meridian, and a table for each gun showing the azimuth and elevation necessary to carry a shot to the centre of every square within its field of fire.

Nothing could be simpler than this scheme seemed to be on paper. But difficulties developed in reducing it to practice. The meridian as a common zero point is wholly unnecessary, and to the practical man looks like a mere multiplication of the chances of error. If it were necessary to have all the guns in any group of batteries graduated to a common zero more accurate means might have been adopted. Suppose for example the commander of the two works at the New York narrows desired to have the traverse circles of all his batteries graduated to a common zero,

he would select some favorable night, and have the guns all aimed simultaneously at say the pole star or any other convenient star. The index on the chassis would indicate the zero point on every traverse circle, and graduation would then be an easy matter. Compare the simplicity, celerity, and accuracy of such a method, with the true meridian method, and the reason why the latter languishes will be apparent.

But the common zero point was not the only difficulty connected with the system. The moment an honest effort was made to carry out the orders on the subject, its impracticability became apparent. The commandant of the Artillery School, having available men and instruments for such work, compiled an azimuth and elevation schedule for the guns of Fort Monroe, and sent a copy of it to Division Headquarters in accordance with the order issued on the subject. The schedule, on its arrival, created something of a sensation. The theorist expected to print the schedule on a small card, to be attached to the gun. Imagine his surprise when he found that it consisted of several hundred pages. The further execution of the order was not insisted on, and position-finding enthusiasm died out.

The failure of that attempt was due rather to its theoretical perfection than to its inherent defects. Its author was a theorist and he attempted too much. He tried to produce a perfect, full-grown system at once. He left no room for natural growth. He saw no reason, perhaps, why full-grown men, for instance, might not be born in future, if proper effort were made by the parties concerned. But nature will not work that way. Perfection is always the result of the last amendment, it is never humanly created.

We regret the untimely death of our position-finding system, if it can be said to be dead. It might have been amended into usefulness. Let us look at it for a moment.

There is the chart of the harbor divided into squares. The idea is good, and perhaps the best that could be devised for position-designating work. But the latitude and longitude method of designating the squares is clumsy. It would be much handier and simpler if they were numbered in one continuous series. It is much easier to find square 40 than B. 15, for instance, on a chart numbered regularly. The chances of error in giving, sending, receiving and executing an order are much diminished by the proposed nomenclature. The other method, while theoretically right is practically awkward, and should be abolished.

Then the chart itself is a very important part of the position-finding and position-designating machinery of the work. In action it would be consulted every moment by the commander of the defenses, the commandants of groups and the captains of batteries. There should be a durable, unsoilable copy of it, which could not be injured by marking on it, permanently exposed at the battle-stations of all these officers. We have described such a chart in a previous paper, and need not repeat it here. It will be remembered that the chart at the headquarters of the group and superior headquarters were also plotting-boards for use in position-finding. The captain's chart was not prepared for that kind of work.

The plotting-board should be graduated on the edge to read to minutes. Such a board was successfully operated at the Artillery School for several years, but with the perversity peculiar to theorists the simplicity of the old-time plotting-board has been destroyed by the introduction of protractors with verniers reading to minutes, and requiring the use of magnifying glasses. This is simply pedantic, and shuts the door of position-finding usefulness against a large class of non-commissioned officers. Besides not one man in a thousand can set or read a vernier correctly, any more than he could thread a needle under fire.

The telegraphic, telephonic or other means of communication with the base ends, commandants and captains of batteries should be of a permanent character, the wires under ground and perfectly protected from injury; the base ends and conning stations should be bomb-proof, and the electric firing wires and batteries should be established in some way which would ensure safety from accidents of any kind.

As described in a previous paper the chart of the harbor at the captain's station is used merely for finding the azimuth and elevation to be given the guns. The position of the target is determined at group headquarters. Occasions, however, might arise when the battery would be required to act independently. In such cases the captain would call upon group headquarters, which is also the headquarters of the position-finding service, for the position of the object to be fired on, and having got it would use it in determining the elevation to be given his guns. The azimuth would be determined by his own telescope.

The captain's telescope has also been described in a previous paper. It is simply a powerful telescope mounted on an azimuth

arc, graduated to correspond to the traverse circles of his guns. It will always give him the true azimuth of the object. The elevation to be given his guns, however, while approximately that due to the position of the object, will always be regulated according to the judgment of the captain, in independent battery firing. He will observe the fall of his shot, or call upon the base end observers for exact information on the subject, and regulate his elevation accordingly.

The occasions for independent action on the part of captains will not be very numerous perhaps. Reconnoitring vessels may have to be driven off, or special work may be assigned to special batteries during an action. But in all general engagements the group commandant should control the fire of the whole work.

But we have dwelt too long upon material and methods. They have been fairly well described in a previous paper. Let us now turn our attention to the personnel of the position-finding staff for a fort or group of—say ten—sea-coast batteries. We have already said that it should consist of two sections, namely, the position-finding section and the position-designating section. Together, they would be known as the position-finding staff of the fort, and should be under the command of a commissioned officer, who might be the engineer officer on the staff of the commandant. His duties would be manifold and important. He would be responsible for all the position-finding and designating material at the post, except that in the hands of battery commanders. He would be responsible for the instruction and efficiency of the men, and the general efficiency of all the position-finding machinery. It would be his duty to drill the sections in their specialties in time of peace, and to supervise their work, when they coöperated with the batteries at drill or in action.

Each section should consist of three reliefs, and there should be a staff-sergeant on duty with each relief. There should therefore be six azimuth instrument operators, and six telegraph operators for duty at the base ends, three telegraph operators for base end telegraphic work in the commandant's conning station, and six operators for the plotting board—that is, for the three reliefs.

The position-finding section of the staff would therefore consist of 3 staff sergeants and 21 operators.

For position-designating there should be one telegraph operator in the commandant's conning station for every battery in the

group, that would be 10 operators, or for the three reliefs, 30. The whole section would therefore consist of 3 staff sergeants and 30 men.

The whole position-finding staff therefore should consist of 1 commissioned officer, acting engineer officer, commanding the staff, 6 staff sergeants, assistants, 51 operators.

Of course the means of communication between the commandant and the base ends and batteries need not necessarily be telegraphic. But whatever the method the number of men above specified will be found necessary.

Captains of batteries will require one telegraph operator in their conning station, who should be one of their own men. The only other man in the captain's room should be his first sergeant.

The numerical strength of the position-finding staff as above deduced, is the maximum required for a group of ten batteries. Of course the work might be done with fewer telegraph operators. One operator might be found sufficient for two batteries. But in organizing for war a cheese-paring policy is never profitable. Besides it might be important that orders to, or reports from all the batteries, should be sent or received simultaneously. The maximum is the only safe basis of organization.

In our paper on the organization of sea-coast defense we necessarily gave a short description of position-finding duties and methods, at drill and in action, in connection with the general subject of organization. It will be unnecessary therefore to retrace the ground now. But we may give a concise recapitulation of what was then said, in order to show how the service now under consideration fits into the general service of the group.

There is to be a general drill of the garrison. Some time before the hour appointed for drill, the Magazine Staff reports to the Ordnance Officer, and the Position-finding Staff to the Engineer Officer of the post. The position-finding staff having all reported at the place designated for assembly, fall in by detachments. The base end operators constitute the first detachment, the telegraphic operators the second, and the plotting board men the third. The magazine staff fall in at the same time. They also consist of three detachments, namely, magazine men, filling-room men, and shot shed men. The senior sergeant of the position-finding staff verifies the presence of his men, and divides the detachments into three reliefs. The senior sergeant of the magazine staff does likewise. Each sergeant then reports to his commanding

officer, and the detachments are marched to their several stations, where they arrive at the hour appointed for drill.

Meantime assembly sounds, and batteries are formed by detachment, the four gun detachments on the right and the ammunition service detachment on the left. The batteries are then marched to the guns, and the detachment to their posts.

The commandant, with his staff, then takes his station and presses the signal button which rings a bell in all the batteries, and at the base ends, and is equivalent to the command "Attention."

There is a steamer in the offing. Imagine that she is a reconnoitring vessel from a hostile fleet. The commandant desires to drive her off, and orders the captain of Battery B to open on her. The order is telephoned, and the captain asks for her position. Meantime the base ends have been ordered, by telephone, "Ready for position of such and such a steamer," and they signal "Ready." The commandant then presses the signal button, and the angles are taken, reported and plotted in less time than it takes to write it. The adjutant, from the plotting board reports the number of the square, which is at once telephoned to the captain of Battery B.

Meantime the captain has had his guns loaded, and has his telescope on the steamer. He has read her azimuth angle, and making the correction for drift and wind which his judgment suggests, has caused his guns to be trained to the true azimuth. If the steamer be moving athwart the field of fire, he soon notes her change of azimuth, and estimates the true azimuth accordingly. By this time the position report comes "37." The captain glances at the chart of the harbor; sees that 37 is in the zone of 18 elevation, and making such corrections as he deems necessary, causes his guns to be elevated accordingly, and fires, at first, by piece, watching the fall of each shot through his telescope. The base end men also observe the shot, and report to the Central Station "over" or "short," which is immediately repeated to the captain at the battery. The captain corrects his elevation in accordance with the reports received, and the azimuth as indicated by his telescope, and continues the firing until the target withdraws out of range.

Should there be a good chance of destroying such a vessel, the commandant would let loose several batteries on her in the same way.

The case of a single steamer in broad daylight is the simplest of all supposable cases for the position-finders, and theoretical position-finders rarely complicate their problem by the introduction of difficult variations. But we desire general usefulness in our system, and must therefore consider all possible complications. Suppose two or more ships are sent forward by the enemy on reconnoitring duty during daylight. They would of course be at long range, and it would be difficult for the commandant to determine the right or left or foremost ship. Assuming that the ships are all alike, how is he to designate to his base end men the particular ship whose position he desires to determine?

The difficulty here presented is always ignored by the theoretical position-finder. But it is a most important difficulty, and must be provided for or position-finding becomes impossible.

Perhaps the readiest and least misleading way out of this difficulty is for the commandant to indicate the vessel by means of a shot—to point out the ship with a steel finger. For this purpose he directs some captain to fire a trial shot at one of the ships, having first warned his base end men to watch for a trial shot. The captain selects the ship which seems to him the best target, gets her true azimuth in a moment by means of his telescope, corrects it for drift and wind, and selects an elevation according to his best judgment, and having laid his gun accordingly, fires, and the selected target becomes apparent to the base end men.

The commandant then orders the base end men, "Ready for that ship's position," and a moment later presses the signal button and the angles are taken, reported, plotted and the position telegraphed to the captain of the battery, before a second shot is fired.

The captain then corrects his elevation in accordance with the exact information thus received, and continues the action. The base end men, in addition to retaking the angles of the ship every time the signal bell rings, report every shot "over" or "short" until the true range has been established.

Should the commandant desire to open other batteries on the same ship, he first obtains the elevation from the first captain, and reports it when he gives order to open to the other captains. Should he desire to attack any of the other ships, he will generally be able to indicate the ship by reference to the one being fired on. If not, he must proceed with a new battery against the second ship as he did for the first one.

Should the enemy send forward a single reconnoitring ship at night, the search lights will readily discover her and her position can be determined as during daylight. But if several ships approach at night another variation of the problem is presented.

The search lights of the group, of which there should be at least two, and if possible three, should not be situated anywhere in the group. There should be one on each side of the group, on or near the line of the base, and inside the base end stations. The other at any convenient point. One of the search lights on the base line should be designated "*The Leader*," and the other "*The Finder*." The third search light might be called "*The Look-out*."

When several ships are discovered advancing at night "*The Leader*" directs his ray so as to just take in what he considers the foremost ship. The Finder then crosses the Leader's ray with his own on the home side of all the enemy's ships, and moves it slowly outward until the first ship is illuminated thereby, and the base end men and captains of batteries at once see the ship to be attacked. Further proceedings are as in daylight.

While the attack upon the leading ship proceeds, The Look-out searcher is sweeping all the approaches to prevent any other ship from stealing a march on the defenders. If any such is discovered the Look-out will let his ray rest on it sufficiently long to attract the attention of the commandant, or he may telegraph his report. The Leader then transfers his ray to the new ship as before, the Look-out transfers his to the ship being fired on, and the Finder causes his ray to creep up the Leader's ray until the new target stands revealed. Its position is then taken and fire opened on it from some other battery, as in the first case. As soon as fire is opened on the second target the Leader moves his ray back to the first, and releases the Look-out for further observations.

It will rarely be necessary, or wise, except during a general engagement, to open fire on more than two targets at once. Should such a thing become necessary, however, a third target might be attended to, leaving one of the two targets in darkness for the few moments necessary to establish the position of the third target. Then one search light would illuminate each target during the action, unless indeed all three were illuminated by two lights, which, considering the width of most of our channels,

would generally be the case. This would release the Look-out and permit it to attend to its legitimate business.

But the most difficult case to deal with is that in which the enemy advances under cover of fog, or in a cloud of smoke, artificially produced for the purpose. In this case position-finding by observation will be impossible, and the defender must resort to other means for ascertaining his whereabouts.

To meet such tactics the defender must have under his control a fleet of scouting boats, swift and strong rams, armed with machine guns, and if possible one dynamite gun each. They should be manned with a view to boarding the enemy's torpedo boats or torpedo searchers, should that become necessary. They are the light cavalry of the defense.

In foggy weather, and whenever the enemy puts on an overcoat of smoke, they should immediately establish contact with him and use his concealment for their own purposes. Two or three such boats should hang on the flanks of his leading ship, keeping concealed in the fog or smoke, and using their dynamite guns judiciously at short ranges. Their safety depends upon their celerity, and their usefulness upon their daring. They should be able to turn the enemy's stratagem very effectually against him. If, however, they are unable to induce him to abandon his undertaking, as he approaches effective range of the batteries of the defense, they must be prepared to give due warning thereof to the commandant, and to indicate the exact point in the channel which he has reached.

For this purpose the channel should be marked out into zones, 300 yards wide, by means of buoys, several of which should be planted on each side of, and if deemed necessary, in the channel, so that the scout boats would be able to tell their exact whereabouts, at any moment. The buoys should be numbered conspicuously from long range inwards to, say 2000 yards range. Under the assumed conditions it would be a waste of ammunition to open fire upon an invisible enemy at longer range than 5000 yards, unless the shape of the channel at some more distant points offered special advantages to the batteries of the defense. There would therefore be only ten regular zones of attack upon an invisible enemy, and the designating buoys would be numbered from one to ten.

As the enemy's leading ship approached the first buoy the scout-boat on his flank would advertise the fact by one short blast

of the steam-whistle, which should be repeated by one or more scout-boats nearer the fort. For the second buoy two short blasts would be blown; for the third, three; for the fourth, four, and for the fifth, one long blast. For the sixth, one long and one short; for the seventh, one long and two short, and so on to the tenth which should be indicated by two long blasts. Only the scout-boats designated for the purpose should repeat signals.

It may be safely assumed that an enemy advancing in this way will keep approximately in the middle of the channel, and a belt 300 yards wide along the middle of the channel will contain all his ships. The commandant will therefore have made preparations to batter and bombard the three squares at number one range before the signal is given, distributing the work to the several batteries according to his best judgment. When the signal is given the batteries open each on the square assigned to it, and with an elevation sufficient to carry the projectiles to the middle of the first zone of attack.

The scout-boats, being of light draft, are not confined to the channel. They can therefore withdraw to the right and left sufficiently far to be entirely out of danger from the guns of the fort, being careful not to lose contact with the enemy. They must close in upon him from time to time, so as to keep perfectly posted as to his whereabouts, and maintain a desultory and distracting if not destructive fire of dynamite bombs upon him as he advances.

It is not to be supposed that the scout-boats will be left to play their game unmolested. Should they show themselves too conspicuously for any length of time to any of their leviathan adversaries, his machine and rapid fire guns would be apt to make themselves unpleasantly attentive. It is not likely that the great guns of the ship would open on them. Their safety in either event depends upon concealment. They must show themselves, if at all, only for a moment, and then disappear in the fog or smoke. In other words, they must play the part of the hornet. But the enemy is morally certain to send other hornets after them. These they must fight as best they may, ever bearing in mind their special part in the great drama then going on. Their dynamite guns ought to be able to give a good account of themselves under such circumstances, but if they are sorely pressed, ramming or boarding tactics must be resorted to.

There is no special reason why the subdivision of the channel

into zones of attack should not be carried closer than 2000 yards. It might very properly, and without causing confusion in the signal system, be continued to the thousand yard range. But it is believed that the enemy will dispense with concealment as soon as he gets within 2000 yards. He believes that he can contend successfully with the batteries of the defense, or he never would have begun the attack. He resorted to concealment to enable him to cross the extensive danger zone which lay between him and his chosen position, with as little loss as possible; but having reached that position, it is as necessary for him to see about him as it is for the defense. If he has worn an artificial coat of darkness then, he will cast it off when he arrives at the 2000 yard range.

The scout boats therefore, as soon as the enemy is signalled in the 2000 yard zone, will make haste to form line for the defense of the submarine mine field.

We do not assume that the enemy's ships will all be inside the 2000 yard range. His formation will necessarily depend upon the shape and width of the channel. His first échelon, in all probability, will be inside a thousand yards; his second inside fifteen hundred; his third inside two thousand. Other échelons at 3000 and 4000 yards, and perhaps beyond will also participate in the battle, firing over the advanced échelons of the fleet. Of course, the number of échelons will depend upon the front of fire which it is possible for him to develop. Of one thing we may be certain: every available gun that can be used will be brought into action. He is satisfied that he can develop a preponderance of fire against the position, and if he must fight on a contracted front, he will resort to numerous échelons.

The general engagement then, may be said to begin as soon as the enemy's ships get into position, and it only remains for us to sketch the work of the position-finding staff during such engagement.

The concealment, natural or artificial, having served its purpose, will now be abandoned. If it was fog the enemy will wait until it clears up. If it was smoke, its generation will be discontinued. This, as already said, will take place at about 2000 yards distance. The enemy must see his way into position. The first échelon of his fleet will move forward into line, advancing to the previously determined distance, and then, if they are heavily armored ships, dropping anchors stern and stem, and opening fire.

The other échelons will do likewise, and in a very short time all will be in action.

It is more than likely that the enemy will concentrate his fire upon one group of batteries at a time. Other groups may be attacked by ships detached for the purpose, but such ships will keep under way and play the part of a retaining force.

The commandant of the group against which the main attack is directed, has now important work to do. He selects targets and assigns batteries their special work. He will try to bring an overwhelming fire upon the selected targets. It is of more importance to destroy a single ship, or even compel her to withdraw, than to inflict double the damage indiscriminately. As a rule the nearest ships will be first engaged, and the batteries will be permitted to fire upon the prescribed targets without restraint or interference. The method of establishing the range will be as follows: A captain is ordered to open on the nearest ship. He gets her correct azimuth by means of his telescope, and estimates her distance. She is sufficiently near for accurate observation and the range is readily established without the assistance of the position-finding staff. Having got his range the captain reports it to the commandant, who directs other batteries, as many as he deems necessary, to assist the first captain in his attack, giving them the elevation at the same time.

Meantime some other captain, at another part of the work has received instructions, similar to those given to the first captain, has selected his target, established his range, and opened in earnest assisted by such batteries as the commandant deems necessary. And so on until all the heavy guns of the group are in action.

But what are the position-finding staff doing during this part of the battle? They seem to have nothing to do with range establishment, at these short ranges. Are they then idlers? By no means. They proceed to establish the positions of all the enemy's ships, beginning at the right of his first line, and taking them in regular order from right to left. The adjutant directs this undertaking. Having telephoned the order "Ready for the position of the enemy's ships," he touches the signal button, and the angles are taken, reported and plotted; the position of the ship being marked on the chart. The signal is again rung and the position of the second ship is determined and marked in the same way. And so on, ship after ship, and échelon after échelon,

until the chart shows a complete plan of the enemy's formation. This will be of great advantage to the commandant.

The battle will, at least, be begun in daylight, and the search light men will have nothing to do with their lights. It will therefore be their duty to watch the enemy's fleet, the leader taking the first and second échelons, the finder the third and fourth, and the out-look all the rest, and report any movement of any ship to the commandant, or rather the adjutant at the commandant's conning station.

Within an hour the commandant's chart will show the exact position of at least thirty of the enemy's ships, and if the search light men attend to their duty, all changes of position will also be noted. The adjutant, on being notified of the movement of any ship, will call the attention of the base ends to the fact, and when she takes up a new position will determine it and plot it on the chart in the usual way, tracing her course approximately from the old to the new position. The full line figure which represented the ship at her old position will then be replaced by a dotted line figure, and a full line figure will be drawn at her new station, so that the commandant can tell at any moment, by merely looking at the chart, the exact position of all the enemy's ships.

It is unnecessary to add anything more. We have outlined the organization, posts and duties of the position-finding staff under every conceivable condition sufficiently at least to exhibit our ideas on the subject. The scheme may not be perfect, no practical scheme ever begins in that way. But it is a workable scheme, and simple enough for soldiers to understand and operate. The machinery required for its operation is neither complicated nor expensive, with the exception, perhaps, of the azimuth instruments, which have already been ordered for many of our forts. The necessary charts might be engraved by the garrisons, but the base end stations, conning stations, and electric wires, must be placed and protected by the engineers.

ARMY TRANSPORTATION.*

BY MAJOR J. G. C. LEE, QUARTERMASTER'S DEPARTMENT.

BREVET LIEUT.-COLONEL, U. S. A.

I HAVE been asked to address you on the subjects of Army Transportation in all its varied bearings; accounts and accountability; and the cost of army administration in different departments; but I shall confine my remarks entirely to the first two subjects, believing it impracticable to bring all the diverse conditions of the several military departments into such correlation as will lead to any satisfactory conclusion, or be of practical value in the administration of military affairs.

Geographical departments are created in the interest of protection and security to the people, and must of necessity embrace all portions of the country, irrespective of the cost of maintenance of troops. That the cost of support of forces in different parts of the Union will vary, is to be expected. It is a question wholly of the cost of supplies and the transportation thereof, and these depend on the kind and quantity of production of required articles, and amount of transportation demanded. As these vary for different sections of the country, it will be apparent that no conclusion could be reached having any practical value, in view of the more important one of affording security to all the people.

Nor shall I touch on the question of accounts and accountability, save where it is connected with the subject of transportation, for two reasons: first, that I have dealt with the matter in another paper, so far as appears proper; and secondly, the first named subject will alone fully occupy all the time and patience you will be willing to give.

The subject of Army Transportation is, as you know, a most extensive and important one, on which the supply and success of armies greatly depend. It is necessarily closely related to the Science of Logistics; indeed may be said to be a most important factor of that science; though transportation in all its branches has, in these later days, become almost a science by itself.

* Read before the officers of the Garrison at Vancouver Barracks, Washington, in compliance with a request of the commanding officer.

So much has been written and said about it, so thoroughly has it been discussed, analyzed and tabulated, that there is little to be added that is in any respect new or calculated to afford any great amount of additional light in regard to it. And in what follows, even at the risk of being prolix and prosy, my aim will be more to attract and direct the attention of the younger men, whose experience has been more limited, than those who have seen war service, to the various details, and to give them such information as is in my power, rather than to advance new ideas or individual theories.

Before passing into the detailed consideration of the subject, I will present a few general remarks touching the relation it bears to all military operations, whether in peace or war.

In our service, the Quartermaster's Department, in connection with its other manifold duties, provides all transportation, of whatever kind or character, both for troops and material of war. It supplies all animals used; furnishes railroad, boat and wagon transportation; builds roads, bridges, railways, ships, boats, docks and wharves: and mans, equips and operates every kind of transport, when occasion requires, from the huge steamship down to the road conveyance. In addition to this, it transports supplies for all other departments of the Government, when called upon.

It must, then, be obvious, that the officers of that department should be men of marked ability, great energy, abundant resource and ripe experience, to fit them for this wide range of duties, involving so closely the welfare of any command.

It will likewise be best that the Quartermaster be a most intelligent and discreet man, capable of quickly comprehending requirements to be met and making prompt provision therefor.

Possessing these qualifications he is likely to gain the confidence and reliance of his commander, a most important condition, inasmuch as his duties involve to so great an extent the well being, and possibly the safety or success, of the command.

It is a well-established principle that the commander of a force, either large or small, should be left free from details, as far as may be, to enable him to devote his time and attention to the consideration of the larger questions pertaining to his command, whether they be in relation to a campaign or to the internal matters of drill, discipline and administration.

A commander contemplating the proper and adequate supply of his forces, either in peace or war, at post or for a movement, should give timely notice to his quartermaster of what is desired, indicating at what points supplies shall be placed and for what period. The latter then takes up the matter; carefully estimates the quantity of supplies to be carried with the troops, the quantity to be provided at other points; when they should be at their destination; and furnishes in due time the required transportation. In doing this he will consider the amount and character of means of transportation available; the region to be passed over; the distance; the character of the roads; the difficulties likely to be encountered, either from floods, storms, an enemy, or other obstacles; the time required; and arrange accordingly—always embracing every possible factor of safety in his calculations. He will also provide for the successive and continuous forwarding of supplies when requisite. If the destination of stores is, for any cause, to be kept secret, he will determine measures to that end.

In all this, he may be called upon to select camps, points of embarkations and debarkations, crossings of rivers, mountains, cañons, etc., and to provide all the means for these purposes.

During peace such duty may be slowly and deliberately planned, with everything favorable, and surely attended to; but in war, it must be done vigorously and quickly, with, presumably, all the disadvantages of being in the enemy's country.

Any campaign in a foreign country, except Canada and Mexico, would necessarily have to be supported across the sea, transportation by which is a simple matter so far as mere carrying is concerned, but a much graver one as to safety from an active enemy.

Once having gained a foothold, however, the army would be on the same footing for a forward movement as in a country adjacent to our borders, the single problem of sea transport lying between.

The main support of inland campaigns is by railroad, and such navigable waters as may be available.

Water transportation should always be profited by, when possible, as it is much the cheapest.

In peace the depots of supply will be located at the most favorable points for collecting and distributing stores and material. In war they will be placed at the nearest points consid-

ered safe—or there may be a system of depots, those well in the rear collecting and storing the surplus, from which the more advanced ones may draw as may be necessary. This insures greater safety to the bulk of stores, but somewhat increases the risk as to supply in case the communications be destroyed for any length of time. It seems best that the great supporting depots should be at, or near, the base of operations, from which supplies may be sent to any advanced point for distribution; and that the great bulk of reserve of supplies should be safely stored well behind the theatre of war. In this manner an adequate supply is insured with a comparatively small proportion endangered.

Armies of any considerable proportions demand vast amounts of supplies, and the work of collecting, storing and forwarding them is a work of great magnitude, and a most important feature of military transactions.

For a single operation, or a raid, a force may carry enough supplies to take it to its object, or to last until its retreat to a place of security, but once established, the means of supply must be provided.

These fundamental considerations having been adverted to, I will now proceed to speak of transportation in detail.

First, as to transportation by railroads. The existing regulations covering service by railroad corporations are now, though somewhat complicated, pretty well understood throughout the army. Under them, as a rule, the shortest route is chosen, though a longer route may be adopted to secure lower rates. It is a quartermaster's duty to obtain lowest rates—by inviting proposals when time will admit, and by personal negotiation when greater haste is demanded.

Travel over land-grant and bond-aided roads is enjoined whenever practicable, or when a saving may be effected thereby. There are four classes of these roads, lists of which are published from time to time in orders.

1st. Land-grant roads which are required by law to transport all troops and stores free of charge.

2d. Land-grant roads which are free highways for transportation, but which are not required by law to furnish rolling stock free, hence are paid a percentage of their tariff rates.

3d. Bond-aided roads to which no payments are made direct, their accounts being settled through the Treasury Department,

and the amounts earned applied to the liquidation of their indebtedness to the Government.

4th. Bond-aided roads to which full payments may be made.

Under the interstate commerce laws, railroads may make special rates to the United States, and where the troops or property to be transported are of any considerable amount, much lower special rates may always be obtained, unless between points where there is no competition.

In making rates, it is well to stipulate particularly the accommodations desired, that no question in regard thereto may afterward arise.

On changes of station, a single company of infantry, with its baggage, will usually be hauled in connection with regular trains; but two or more companies of infantry; a troop of cavalry with its horses and baggage; or a battery of light artillery with its baggage, horses and guns, will be, as a rule, run separately and special, though at times they may be run as a division of a regular train.

For anything like a long run, that is to say, for over twenty-four hours, it is now customary to use emigrant sleepers carrying from thirty-six to forty men each for the enlisted men, such cars being convertible into bunks or seats at pleasure, and having facilities for making coffee and doing light cooking. The sanitary condition of these cars should be looked after with exceeding care when offered for use.

For a few officers it is always troublesome to provide sleeping accommodations for a short run, when not travelling by regular trains; but for ten or more, a Pullman car can be secured. When a very small number of officers have to make a long journey with troops, and sleeping berths are absolutely necessary, a tourist sleeper can usually be chartered by the day, which, though not as comfortable as the regular sleeper, is yet fairly good, and has, like the emigrant sleeper, some cooking appliances, a most advantageous feature when running on an irregular train. The expense of a Pullman sleeper is so great that it cannot always be afforded for a small number of officers. In such cases where more than tariff rates are requisite, the Quartermaster General must be appealed to.

The water tanks of all cars are entirely inadequate for holding a sufficient supply of water for troops on railway journeys, hence it will be well to provide water barrels with double rimmed heads

fitting over the top, and secured by a strong hinge and hasp and staple, one barrel on each end of every car. By filling these whenever occasion may offer, the men will have abundance of water both for drinking and ablutionary purposes.

Next in order comes the proper provision for the transportation of animals. For these, stock or combination cars carrying about sixteen mules or fifteen horses should be provided, though a still better class of cars is now built and coming into use in the East. Cars for animals should also be carefully inspected before being used, and if there be even the slightest suspicion of uncleanness, they should be thoroughly washed, and then swabbed out with a disinfectant,—the best being a weak solution of corrosive sublimate,—and afterward allowed to dry. Extensive losses have followed the omission to take this precaution.

Provision must be made for forage along the route, either by carrying it, or purchase en route. The transportation of stock has of late years been reduced to such a system, that forage at reasonable prices is furnished at stations at suitable intervals along the railways, where are provided ample means for loading and unloading, resting, feeding and watering. This should be done on an average, once in twenty-four hours, and from four to six hours at a time. This wise and humane course, demanded by all experience, has been imposed by a law of Congress, which provides that all animals shall be rested, fed and watered, at least once in twenty-eight hours during railway transit.

At the expiration of a journey, animals should be unloaded as soon as possible, put in comfortable stables when practicable, and fed a warm bran mash if available.

Box or baggage cars are provided for freight or the property of a command, in which it should be closely packed, and in such order as will admit of the use of stores needed en route, and immediate access to that first needed on arrival at destination.

Flat or gondola cars are furnished for coal, vehicles—when not taken apart, heavy machinery, heavy guns, lumber, wood, baled hay, rails, heavy iron, and material of such character.

In connection with railway transportation, either in war or peace, it will become necessary at times to unload animals, artillery, wagons, etc., from trains at points distant from stations or platforms. In such cases the commander or quartermaster will promptly avail himself of any material at hand for building a temporary, make-shift platform,—such as lumber, rails, cordwood,

or, if nothing else can be had, of the very ties of the road itself, if appliances for drawing or breaking the spikes can be devised, withdrawing alternate or third ties, so as not to disable the road.

Sometimes it becomes necessary, as in traversing the desert portions of our southwestern country, to provide water for troops marching along a line of railway. This is best accomplished by negotiating with the railway company to deliver one or more of their car tanks at desired points. Such had to be done extensively on the occasion of the interchange of the 3d and 10th Cavalry between Texas and Arizona.

In time of war the construction, repair and running of railroads frequently devolve upon the military authorities. Construction of new roads is not as likely to occur as the repair of old ones which have been more or less destroyed by the operations of the army itself, or by the enemy. Such repairs must rapidly follow the advance of the army, and due provision for them must have been made, by the accumulation at some point convenient for use of ample ties, rails, engines, cars, extensive bridge materials, and all the lesser adjuncts, preparatory to the movement. The greater distance the army advances, the greater the complications and difficulties. The road will be found utterly destroyed in front, rails gone or bent, stations, shops, and bridges burned, desolation in all save the grading, though this, indeed, will be destroyed at cuts and embankments all that may be possible. The restoration, however, is not as slow a process as it is expensive, provided foresight has been adequate and provision ample.

All this must be done by the Quartermaster's Department, though, as in our War of the Rebellion, able and experienced railway men would naturally be called to its aid.

As an instance of the energy and foresight displayed in such matters, I refer to the management of the Orange and Alexandria Railroad, from Alexandria to Manassas Junction, and beyond, over which single track the Army of the Potomac was supplied for many months, during which it was a daily occurrence to have a bridge or two burned, frequently the important one spanning Bull Run. Yet such was the provision made, that most of these bridges were lying in duplicate already framed in the yards at Alexandria, including the larger ones, and especially the one for the stream referred to, against which, perhaps from its size, the rebels seemed to have an especial spite. We kept well prepared therefore for mishaps to that one, which, though a large

bridge, we could replace, when wholly destroyed, in from 12 to 24 hours.

In all the larger operations of moving troops, animals, or material of war, requiring many trains, such as the movement of brigades, divisions and corps, or extensive amounts of supplies, it is most necessary to acquaint railroad officials well in advance to enable them to assemble the requisite cars. Indeed this is always essential, especially at the lesser stations, inasmuch as energetic railroad management permits no serviceable cars to lie idle, even at large or terminal points.

Of no less importance to the military service, is transportation by water, whether of the sea, lake, river or canal.

Here, as in the railroad service, it is by shortest and cheapest routes, and under like conditions as to rates. But the question of accommodations is much simpler, as officers are furnished cabin passage and can be provided for whether few or many. For short voyages, the men can comfortably bivouac between decks. For longer ones bunks are set up, either by the ship or the United States. These berths should not be less than 6 ft. 6 ins. long by 4 ft. wide, for two men, but these sizes may be slightly lessened or increased according to the amount of space to be occupied. There will be as many tiers of berths as the height between decks will properly admit. Means of cooking are to be provided—usually by the ship, but sometimes by the Quartermaster's Department. Water is always supplied by the ship.

Much care must be devoted to the preparation of ships for the transportation of troops by sea, and to provision for ventilation and cleanliness on the voyage. Men cooped up between decks, especially if the sea be rough and ventilation imperfect, suffer exceedingly and lay the foundation for much ill health afterward. One can hardly imagine the vile condition and wretched atmosphere of a ship laden with troops for any length of time, and not properly cared for, unless he has witnessed it. Officers should insist on proper ventilation being provided; that the hatches be kept open when practicable, and when not, that abundance of fresh air be sent down by funnel ventilators, or wind-sails; and above all, that the decks occupied by the men be properly cleansed and cared for.

The embarkation of troops should be carefully studied and provided for. The capacity of a ship should be ascertained and berths fitted up; cooking arrangements provided; abundance of

water and ample stores secured for the whole voyage, with adequate surplus for emergencies. All freight, stores and material should first go on board, and be stored so that what is needed on the voyage may be readily reached, and that needed first at the end of the voyage, placed where it may be had promptly. If animals are to go with a command, they are loaded after the stores, and just before the men. After every other provision is made the men should go on board, and not until then.

For shipment of animals by sea or lake, when motion of the waves is certain, it is essential to provide stalls and feed boxes, which must be so arranged as to permit of easy access for feeding and watering, which should be done morning and evening as in garrison.

These stalls may be lined with gunny stuffed with hay if heavy weather is to be apprehended, and indeed should be for any voyage beyond two or three days.

The arrangement of the stalls will be determined by the size and shape of the space to be occupied. Knowing necessary sizes the plan can be accurately laid out on the ship's deck before the stalls are built, preferably from side to side, but not necessarily so.

The plan that was found best during the war was to leave about 2 ft. along the side of the ship for passage way for rear cleaning; set very firmly on this line a row of strong stanchions not less than 4 by 4 inches in size, to form stalls for four animals, at intervals of about 8 ft. for horses, and 7 ft. for mules. Then set up a corresponding row about 5' 6" for horses, or about 4' 9" for mules, distant from first row with a third row midway between of 2 by 4 inch stuff. Then leave about 3½ ft. space for head, cleaning and feeding way, and set other like rows, in the same direction or perpendicular thereto as may be most advantageous. These stanchions are then boarded up on both sides. At the rear, on both sides of every quadruple stall, nail strongly to sides of stalls 1½ by 3 inch strips, against which nail the rear partition to about 3' 9" high leaving 2" space between boards and 2½" space at bottom. Against front stanchions, similarly nail like strips, and 1½" distant therefrom nail 1" by 2" strip. Into the groove thus made, insert loose boards like bars to a height of 3' to 3' 6". The object of this is to admit of the removal of a dead or disabled beast.

The animals being backed into the stalls, the front boards are

placed in the grooves, thus penning them in and holding them in place for the trip.

One (or more) additional stanchion must then be added in front and rear, to strengthen to such extent as may be necessary. They can be added from without at any time. All these stanchions need to be very strongly set, as the weight on them in a rolling sea is considerable, and frequently accompanied by heavy thrusts, occasioned by the mass of animals being precipitated first one way and then another.

The long forage should be cut for sea voyages, and bran should, if practicable, be taken to the extent of one third, or even one half the grain ration, mixed and moistened feed being best.

The decks should be cleaned once every day at least, when weather and circumstances will admit, either by water or other method.

It has been my fortune to ship a very large number of animals by sea, reaching in one year to the large number of 65,556, of which over 10,000 were horses and mules, yet our losses were exceedingly small. On one occasion I had to defend an extraordinary loss, caused by a storm off Hatteras, and on looking into the question of losses under similar circumstances I found that the British Government in shipments by sea during the Crimean war lost enormously, while the aggregate of my own, including the large one of 255 out of 355 in the shipment referred to, reached a little less than two per cent.

When animals have to be hoisted on ship-board, a kind of sling is used, consisting of a broad, heavy, strong canvas band, wide enough to embrace the entire body between the fore and hind legs. The ends of this are securely fastened around stout spreaders of wood, ropes being attached to fore and aft edges, and to the ends of the spreader-sticks, meeting outside of the stretchers. Straps are buckled before and behind, and the animal blindfolded when practicable, for his aerial journey. Then with a hoist he is quickly lifted high into the air and with a running swing gently landed where desired.

As a rule, in our service, we have chartered ships and vessels of every kind, for shorter or longer terms of service, though we have also used merchant transports in the ordinary way to a great extent.

When boats are under charter, it becomes most necessary for

the quartermaster in charge to be exceedingly vigilant, or he will not get worth for the public money. Captains and crews under these circumstances appear to join hands to do as little work as possible.

The quartermaster must also have a watchful care that arriving ships be duly unloaded, or expensive demurrage will follow.

The Government had a system during our Civil War, under which boats, after a certain term of service under charter, became the property of the United States. In addition to these some vessels were purchased outright. When such are run by the United States, either a contract must be made for manning and victualing, or the crew is regularly hired and the victualing done by contract, or as done by merchant ships.

The merchant transport ships of Great Britain, have, for some years, been built with a view to their being used as carriers or transports and for cruisers in case of war. It seems to me that it would be wise for our government to adopt a similar course.

In the management of water transportation, the Quartermaster's Department has frequently to build boats, docks, wharves, etc., both of a temporary and permanent character, and provide all machinery and appliances for rapidly loading and discharging ships.

One more important consideration must not be omitted, viz.: the abundant supply of coal for the use of ships. At the great depot of Alexandria, of which I had charge from 1863 to the close of the war, we used on an average from 1000 to 3000 tons of coal per day, though this will not appear singular when I state that we had as many as 400 sea and bay going craft of all kinds employed, and as many as 140 at one time in harbor, many of which, varying in size from the harbor tug to the largest iron steamships of that period, were propelled by steam.

Passing now to wagon transportation for the army, we come to a most important and extensive branch of the transportation service, and a very vital one to operations in the field.

During peace the great bulk of hauling on the longer routes is done by contract, and to some extent also during war. For the immediate use of posts public teams are provided in such numbers as the allotments of animals from time to time will admit. Mules, in the main, are the animals employed, though in the great cities, and the northern and western States, horses are used to a limited extent. The well-known six-mule wagon, what is

now known as the escort wagon, spring wagons and carts, comprise the vehicles mainly employed, though special light wagons and drays are sometimes used for depot and post service. All animals, harness and vehicles are provided by the Quartermaster's Department, and specifications therefor are established and promulgated.

During a period of war public teams are, as a rule, provided for use with troops. In case the number available be insufficient, the quartermaster will hire if in his own, or seize if in an enemy's country, paying therefor or not, as may be best. All teams and vehicles of a region in which an army may be operating may properly be made subservient to its uses.

A vast number of teams is required for the supply of an army of any considerable magnitude operating at a distance from a railroad or navigable water.

The allowances of teams for field operations will, of course, be governed by circumstances, and determined and announced by the commander. The usual needs have been pretty accurately determined and published, hence I do not set them forth in detail. But that an approximate idea may be had, it may be stated that for active campaign purposes in time of war, a regiment of infantry will require from 6 to 12 six-mule wagons; a troop of cavalry or mounted battery of artillery, 2 to 4; a brigade from 30 to 60; a division from 102 to 192; a corps from 320 to 590; all according to the strength of the force.

It is curious to note how greatly the view of what was a sufficient amount of wagon transportation changed during our late war. When it began a single regiment would have a large train, as many as two, three, and even four wagons to a company; but toward the close the allowance fell to one wagon to two companies and was found to answer. But of course the companies were not as strong, and the men were far more habituated to carrying part of the equipment. And these later allowances presupposed that supplies were to be brought forward by trains especially provided for that purpose.

For practice marches during peace, involving the transportation of all supplies, including limited tentage and ammunition, over fair roads, it is roughly estimated that a company of infantry needs a six-mule team for a 5 days march, $1\frac{1}{2}$ for 10 days, and 2 for 15 days. If the roads are bad the allowance would have to be increased.

A troop of cavalry or mounted battery carrying short forage will require 2 wagons for 5 days, 3 for 10, or 4 for 15 days.

Longer marches without replenishment are rare in these days of railroad and more thickly settled condition of the country, but if imperative, necessary teams must be added.

It is customary in the larger field operations to detail wagons to the Engineer Corps for carrying pontoons and bridge material; to the Signal Department for field telegraphs; to the Ordnance Department for ammunition; and to the Subsistence and Medical Departments for their supplies. This is done for convenience and expedition in their operations, the respective departments having officers assigned as quartermasters for the purpose. It may become necessary in the future to increase such details, especially to the Ordnance Department, on account of the increase of ammunition that will be used.

And here let me turn aside for a moment from the main direction of these remarks to suggest the wisdom of providing light, strong, rather large-wheeled, carts, which may be hauled either by an animal or by hand, one to be attached to every wagon of the ammunition trains, and hauled habitually empty when on the march, behind the wagon; to be used for getting ammunition to the front during engagements in such places as wagons cannot reach. With these, six or eight hundred pounds could be quickly hauled by one animal or two or three men, thus doing with facility the work of 3 or 4 pack mules, or many men carrying a box each, and with far less fatigue. The carts being with the ammunition train would be at hand for use when wanted, and by reason of their effectiveness would, it seems to me, be a most valuable aid on many occasions, and especially so in critical moments demanding an unusual supply of ammunition.

The question of loading animals and wagons is a most important one and deserves careful consideration. If lightly loaded they will make longer day's journeys, but their value as means of transport is correspondingly reduced. If too heavily loaded they will soon wear out. In either case the fullest service practicable is lost. The necessity of rapid transit will decide the former, and ultimate good, the latter, a happy mean being the best when circumstances admit.

The following loads are about what may prudently be carried:

Pack mule—In mountainous or bad roads, 100 to 150 lbs.; in good roads, 160 to 200 lbs.

Escort wagon—In mountainous or bad roads about 2000 lbs.; in good roads, 2500 to 3000 lbs.

Six-mule wagon—In mountainous or bad roads about 2500 lbs.; in good roads, 3500 to 4000 lbs.

The travel of wagon and pack trains may be placed at about 2 miles per hour on bad roads, and from $2\frac{1}{2}$ to 3 miles on good roads. If distances be known the time of travel may be accurately estimated. If not known and a map be at hand, ten to twelve miles in a straight line thereon, will about equal an ordinary day's march, the sinuosities of roads making such an estimate very nearly correct. Unknown distances to be traversed should be carefully measured by the odometer.

It is the quartermaster's duty to arrange and superintend personally the movements of trains, and accompany and direct them when practicable. He should make sure that his transportation is always in the best possible order, and should inspect it daily, at least, to see that animals are shod; that spare parts are provided and carried; that harness is kept in good order; that shoes, nails, axle-grease, leather, buckles, rings, chains, thread leather, strings or thongs of rawhide or buckskin, rope, linch-pins, open rings, etc., are on hand. He should be provided with a portable forge, smith's tools, a smith and a small supply of iron and coal. Every train of 25 wagons should have one wagon master, two assistants and two extra men, one of the latter being the cook. This will provide for the examination of the road in advance, for any falling out of teamsters by sickness or injury, and for the assistance of disabled teams.

If two or more such trains are united as for a division or corps supply train, there should be a superintendent over the whole.

Trains must as a rule be so directed that they will not interfere with the movements of troops, and to this end the commander will generally indicate the route the wagons will take. If they come in contact with troops or ambulances, they are habitually required to yield. In some cases, however, it is regarded best to have the troops take the side of the road, as was ordered for the great march to the sea, for the reason that they can better march off the roads than the wagons can, and are on hand to assist the wagons in case of need.

A prudent commander will have due regard for the safety of his trains, and escort them suitably when necessary. But vigilant

watchfulness on the part of the quartermaster will be essential, especially in an enemy's country. He should keep his trains strictly under control, and take careful precaution for their security, especially when parking them. If for defense, the wagons should be drawn up in a circle, to form a corral in which the animals may be most safely kept and controlled.

When ordinarily parking trains, in places regarded wholly secure, it will still be well to observe precaution for safety, and so arrange that the whole or a part of them may be used speedily and without confusion. It is regarded best that trains in secure places be parked in one rank facing the roadway, so they may pull out compactly at command. If animals are turned loose to graze they should generally be hobbled.

We may now proceed to the consideration in detail of some of the principal component parts of trains; first as to animals.

As has been stated, the draught animal chiefly used in our service is the well-known, patient, plodding, forbearing, hardy mule; but horses are used to some extent, and oxen and dogs are occasionally employed.

The mule commands respect in more ways than one. His usefulness is proverbial, as is also his carelessness with his heels. He is a strange animal, with singular ways, odd fancies, abundant docility, and withal a lurking strain of viciousness. His intelligence and instinct are marvellous, embracing many points of knowledge beyond that of his master. He will smell an Indian farther than his driver will ordinarily see one; he will follow the bell-mare of the herd by smell as unerringly as a hound; and he will surely find the road in the dark when his master cannot see to guide him. He is easily herded under ordinary circumstances and just as easily stampeded by extraordinary ones. But most of all he is to be commended for the patience and hardihood with which he will toil on, day after day, in the service of mankind. He has been a most important agent in war, and is no less so in peace. He lives to a good old age, his usefulness frequently extending to 18, 20 and even 25 years. His disposition, peculiarities, tractableness and usefulness are well set forth in Riley's book, with which most army men are familiar.

For all purposes the mules bred in Kentucky and Missouri are considered the best, but good mules are bred elsewhere though not in large numbers. The Spanish Mexican mule is regarded as the toughest. My experience is that the latter makes

the best pack mule, but is too unmanageable for train purposes in general.

Team mules are classed in three grades;—wheelers, which should be the largest and stoutest; swing, which should be the medium sized; and leaders, which should be the smaller sized ones. Pack mules should not be too large or high. Those with short, stout legs are best.

Handled gently, all mules grow trustful, kind, and good-natured; handled roughly, the reverse ensues. Especially should they be handled carefully at the first, particularly about the ears.

In herding them it is best to associate them with a bell-mare, —a white one preferred,—which they will stay around and follow with little care.

Much diversity of opinion exists as to watering mules on the march, some contending that they should be watered freely and some that they should not be watered at all. My experience has been that it is best not to water them during a march, even though the journey be at once resumed, as it makes them heavy and loggy, unless indeed the march be a long one, in which case it is better to give them a very little than to water freely.

Good horses are found throughout the length and breadth of the country. As a rule they are easily broken to the uses of man, and mostly come to us accustomed to saddle and harness. They are tractable and rarely troublesome.

Oxen, once extensively employed, are now little used except for freighting under contract in the Northwest, and those portions of the country bordering on Mexico.

Dogs and sledges were used years ago in northern Michigan and Wisconsin during the depth of winter, when they were the only means of communication with distant posts in that region, but they are now a thing of the past and may be relegated to their natural masters, the Laplanders, Greenlanders and Icelanders.

In connection with animals and roads heavy either from deep snow or mud, it is well to note that mules become disheartened and give up after a good deal of effort. Horses are more ambitious and forge ahead a long time. Oxen will endure under such circumstances longer than either mules or horses.

It is most important that the shoeing of animals be particularly looked after and their feet kept sound and perfect. No feature of ordinary usage will sooner disable an animal than bad

shoeing. It is ordinarily left too much to the smith, who is often a mere hammerer of iron and knows nothing of the delicate and complex organism of the horse's foot.

Harness of the established patterns is now mostly supplied from the Leavenworth Military Prison. In time of war it would have to be supplied largely by purchase.

Pack saddles and aparejos of different patterns have been furnished as occasion demanded. What was known as the McClellan pack saddle (though I do not know whether invented by the General or copied from his well-known riding saddle), has been most extensively used, of all pack saddles proper, but no form of saddle for carrying loads has been found equal to the Spanish aparejo, or Moore's patent pack saddle modeled after it. The misfortune of it is, that it requires special skill in its use, and this is not generally to be had. Only men who have served on the Mexican border, or have been especially trained to its use, can manage it. No written instructions can convey the knowledge; it must be seen to be appreciated, and learned to be useful.

Too much attention cannot be given to fitting harness and pack saddles to animals. Unless this be zealously looked after they will quickly become disabled. Nothing tends more to render animals unfit for service than ill fitting harness, especially collars and saddles. They should be fitted slowly and by actual wear, and strictly watched until it is manifest that no injury will arise. Each animal should have its own collar, or pack equipment. It is a common practice of teamsters to soak parts and put them on wet so as to fit them, but this renders the leather hard, and liable to lead to chafing afterward. Collar pads are most beneficial, as they adjust the pressure and protect from the weather. The fitting of the hames to collars and the harness generally to the animal are second only to fit of collar or saddle. Even bridle bits and throat-latches need to be adjusted. All this should be carefully done at the beginning, and further looked after, should animals become thin from hard service or exposure.

Pads or chambering should be resorted to the moment the slightest tendency to gall is noticed. Galling always arises from some uneven bearing against the part.

A critical inspection of every mule train should be made as it sets out every morning. If any mule be seen raising his lips and twitching his mouth and nose, be sure he is sore somewhere and needs looking to.

The wagons supplied the army for campaign purposes are of two patterns,—the six-mule, and the two or four-horse wagon known as the escort wagon. The former is an old and very familiar acquaintance that has won a world-wide approval for its strength and endurance under the heaviest strain. As we who have seen it tested to its uttermost on many occasions can well speak, it is a most superior structure for the purpose for which it was designed. How well it has borne its part in the westward advance of our frontier and in our great campaigns, there is not one of us but can speak favorably. Faithful, strong, clumsy, old friend, it has brought to us our food and raiment and shelter and belongings, in safety, many a weary mile, through snow and mire, through mud and alkali dust, over lofty mountains, across deep rivers and wide plains, ceasing its march only when it had deposited its load at our far-away and perhaps lonely doors.

Of its younger brother, the escort wagon, it hardly becomes me to speak, as I am, individually, its parent. For though the board sitting at Philadelphia in 1876 was finally unanimous for the adoption of the wagon, it at first stood four to one for a lighter wagon, and no persuasion could then induce them to change their minds. However, I had procured funds for setting up trial wagons, and all consented to having one set up on my plan, on the basis of a two-inch axle and felloe, which being found to give one and a half times the strength of the one they inclined to, with an increase of but 55 lbs. in aggregate weight, the entire board were won to my plan. And I feel I may point with pardonable pride to the result, as having satisfactorily met a great want for post, escort and light campaign purposes.

I have since thought, however, that both wagons might be lengthened to advantage.

In campaigns, the wagons of the various commands should be distinctly marked both on the body and cover, to avoid confusion and secure their proper destination.

In all expeditions where wagons are used, much trouble will be encountered from loosening of the tires, spokes, etc. Long journeys over rough roads, and in very hot climates such as in Texas, New Mexico, Arizona and Southern California, and even in Oregon, Washington, Idaho and Montana, will tell upon the very best made wheels, and the spokes and tires will become loose, often when means of proper repair are not at hand. With tires there may be no other remedy than that of wedging. This should be

done as evenly as possible and from both sides of the wheel, and it will be found best to soak them afterward in salt water. If spokes become loose in the hub, a good temporary remedy is to take two pieces of timber, the diameter of the wheel in length, having each one level surface; notch the four ends so they will fit the felloe tightly; lay them parallel across the face of the wheel, one on each side of the hub; and bind every spoke to them as firmly as possible with rawhide, keeping the lashings as close to the centre of the wheel as may be. The drying of these thongs will shrink them so that the wheel will be quite firm again and serve a long time. Broken spokes may be repaired by lashing pieces to them, closely fitted between hub and felloe, by the same method.

However, these steps need only be resorted to in emergencies. A prudent quartermaster will nearly always be found with spare parts, such as wheels, tongues, reaches, hounds, bolts, and repair material already referred to. If not, he will soon improvise them from a neighboring forest fence or wood pile.

Spring wagons of the Dougherty pattern are supplied for official transportation of paymasters and others, on routes having no public lines of passenger travel.

The one-horse cart, though not laid down as an authorized vehicle for army service, should be so, as it is a most useful article for post and stable use.

Ambulances, litters, stretchers and travois are provided by the Quartermaster's Department, but are usually under the immediate direction of medical officers.

The great value of the pack train must not be overlooked. Pack mules are not regarded best for long marches, or where wagons may be used, but as helps or adjuncts to wagons, and for difficult, mountainous and unexplored country not adapted to the use of vehicles, they are invaluable; also for carrying ammunition, subsistence and medical stores to the front in battle, to places that wagons cannot reach, for which purpose, however, only the oldest and steadiest animals should be selected.

The management of pack trains is an experience by itself, and requires careful study and observation, as well as special aptitude. The details are too numerous even partially to enumerate them, and are yet quite simple in practice.

Another problem of transportation arises in the passage of streams which may be encountered in a line of march. It is all

very easy when bridges, ferries or practicable fords can be availed of, but when none of these offer other measures must be resorted to, such as the construction of a temporary bridge or ferry raft, of which there are many kinds. But I feel that I have already taken up enough of your time, and must leave many points not touched upon.

I have thus outlined the principal features of the transportation on which our army has to rely under all circumstances, with reference to source, utility, management and effectiveness. I have not gone minutely into allowances and organization, as these must depend largely on circumstances and needs, and be controlled by existing facts. After all, theory is one thing and practice another, and practice will be worth more than all else. One may present the situation of to-day, but it will be lost in that of to-morrow. In the campaigns of the future, troops and supplies will undoubtedly be handled by rail and boat, even to a much greater extent than in past times, hence both commanders and quartermasters will do well to familiarize themselves, as much as possible, with the details of those great means of transport, especially as to capacity, celerity and management. Particularly will it be found advantageous to know prominent railroad and steamboat men, that they may be turned to, in time of need.

Transportation, promptly and effectively supplied, is of the utmost importance to the success of military operations in peace or in war, by land or by sea, everywhere; and just so surely as it is otherwise, may we expect imperfect success, if not indeed positive misfortune or disaster.

WAS GETTYSBURG THE DECISIVE BATTLE OF THE WAR?

BY COL. THOS. M. ANDERSON, 14TH U. S. INFANTRY.

THERE is no subject of discussion that gives rise to keener controversy than this question as to the decisive character of the battle of Gettysburg. Whether the discussion arises in fireside chats of veterans in Grand Army posts, in Loyal Legion meeting, or the more formal debates of the Military Service Institution, a marked diversity of opinion is sure to be developed.

The many who are disposed to magnify the importance of this contest, generally assert that if General Lee had won the battle he would have captured Philadelphia and that upon this event the Union would have been dissolved.

Those who hold this opinion have much to say of Northern disaffection, draft riots, and foreign recognition.

On the other hand, there are military critics who claim that these assertions—"Of what might have been"—are foreign to the issue. All history, they say, can be reconstructed in this way.

What, for instance, "would have been" had Xerxes won at Salamis, or had Hannibal taken Rome? What, if the Russians had won in the Crimean war? If the young Pretender had not turned back from Derby, Humbert and Margheretta might be reigning in London, and we, just possibly, loyal subjects. So Pickett's charge might have succeeded and the Rebellion triumphed.

But the question is, what was the legitimate consequence of the actual event? This is the issue we propose to discuss, and not the vague possibilities of an irrevocable past.

Up to this time, very few military writers have taken the trouble to contradict the assertion that Gettysburg was a decisive battle, or to make an analysis of the data upon which it is founded.

From the fact that the battle in question was the only one fought in a northern State, that the battle-field is of easy access, and, above all, from its dramatic effect in having relieved populous communities from the terror of invasion, an exaggerated importance has been attributed to the event.

It was a great event, yet, from a military standpoint, very nearly a drawn engagement.

By way of illustration let us compare it with Waterloo, which is popularly cited as a typically decisive battle.

Napoleon's and Wellington's armies corresponded in number, very nearly, with the fighting strength of the Union and Confederate forces at Gettysburg. The French loss in their battle, leaving out of consideration their disintegration in flight, was about the same as that of Lee's army on the first, second and third days of July, 1863. Mark the difference however. Their loss was sustained in eight hours, while the Confederate loss at Gettysburg must be divided between three days. The most striking difference remains to be noted. At Waterloo there was a successful counterstroke; at Gettysburg no countercharge was attempted. The rebel host marched off with banners flying. Their loss in retreat was comparatively light. At Williamsport, although in a most dangerous position, they stood at bay and were not attacked. General Meade seemed to be acting on the axiom, "make for a flying enemy a bridge of gold." But was his enemy flying? Confederate writers claim that Lee retreated to the south side of the Potomac for lack of ammunition, rather than the stress of positive defeat.

A broader and less technical view should be taken. Those who assert the decisive character of the battle of Gettysburg, ignore the fact that the war continued actively for twenty-two months after that engagement. There is an evident difference between even a great victory and a really decisive battle. Such battles as Salamis, Pharsalia, Hastings, Austerlitz, Waterloo, and Sadowa, were followed by immediate and definite results. There have been many other battles more bloody and as famous as those named, which were not followed by the collapse of the power of either of the contending parties.

Napoleon lost more men at Leipsic than he had in his army at Waterloo, yet it is not spoken of as one of the great decisive battles of history, because it subsequently required a vigorous campaign and a number of battles to compel a peace.

It is not the number engaged nor the sanguinary character of the contests which make battles decisive.

Very small battles have been followed by lasting and important results. Yorktown and San Jacinto on this continent are instances in proof.

Other writers draw the distinction that Gettysburg was the turning point in the war. It would hardly be worth our while to discuss this distinction, were it not that the heroes of Gettysburg seem to be monopolizing an undue share of glory.

Alone of all our battle-fields it is covered with monuments, and the literature of the campaign already fills volumes, and the participants on both sides are lauded to the skies, and handed down to posterity as exemplars of chivalric virtue. We would not pluck one laurel leaf from a single chaplet. All glory to the mighty dead, all honor to the worthy living. "There is glory enough for all." Yet as there were mighty men before Agamemnon, so there were great battles beside Gettysburg and, as we will undertake to show, engagements more decisive.

American criticism abounds in quotations and statistics, yet no great display of learning will be necessary to make good our proposition. It will only be necessary to recall facts known to nearly all readers.

It is well known for instance that Pemberton surrendered his army at Vicksburg on July 3d, the last day of the Gettysburg fight. We have the authority of General Grant for saying that the fall of Vicksburg sealed the fate of the Confederacy. Be that as it may, it was a severer blow than Gettysburg. There the Confederate loss was about thirty-one thousand men. The loss in the Vicksburg campaign, including the consequent loss of Port Hudson, was 45,160 men. This was not only a much greater loss than the Confederacy could afford, but the opening of the Mississippi cut the Cotton States in two. Worse for them than this, it enabled the Government to bring to bear both Scott's anaconda policy and Grant's policy of attrition. After Vicksburg there was no avoiding the squeezing or the blows. Yet even this was not a decisive victory. For subsequently, both to Pemberton's surrender and to Lee's retreat from Pennsylvania, the rebels won their greatest victory at Chickamauga, a defeat that might have proved fatal to us, had it not been redeemed in two months by the battle of Chattanooga, which was really the turning point in the war. Please recall in this connection that after Gettysburg, Longstreet's splendid corps was detached from the Army of Northern Virginia and sent to reinforce Bragg's Western Army. After Longstreet left him Lee assumed the offensive and manoeuvred Meade nearly back to Centreville. Would it appear from this that he had sustained a crushing defeat? There was no indication of conscious

weakness on Lee's part, until after the battle of North Anna, fought nearly a year later.

At the opening of the Wilderness campaign (1864) the Army of Northern Virginia was larger than any army Frederick II. ever commanded, and, I believe, of better quality.

So far from being broken in spirit, it had unbounded confidence in its leader, was full of military zeal, and was fanatical in the cause for which it was fighting.

There is no telling what it could not have accomplished had it not been opposed by an army that was proof against discouragement and commanded by a man who united the inflexible determination of Wellington with the bull-dog courage of Blucher.

From the standpoint of the strategist, Chattanooga was as bad a defeat to the South as Vicksburg, and much worse than Gettysburg. The concentration of the Union troops, which insured this victory, was as brilliant and as accurately a calculated combination, as that which led to the surrender of Mack's Army at Ulm. Its results were as great, for it deprived the Confederates of the use of certain lines of communication which were of the greatest advantage to them.

Yet their cause was not hopeless in the spring of 1864. Two of their great generals commanded formidable armies. The odds were great against them, but not greater than those over which Frederick triumphed in the Seven Years War, nor than those our fathers had to contend against in our War of Independence.

In the Wilderness campaign Lee adopted the offensive defensive, and I think that the men of the Army of the Potomac will bear witness that our enemies opened the fight with all their old-time dash and enthusiasm. They charged with their old fiendish yell and kept on coming until we fought hand-to-hand and foot to foot. An officer on the headquarters staff told me that Grant went near enough to the front on the second day's fight, to see what manner of men he commanded and how the Johnnies fought under Lee. He saw men standing in the flaming forests fighting with their coats burning on their backs. He saw men fighting, unappalled, while fallen comrades were being consumed with fire at their feet. He saw men fighting in such a storm of bullets that trees were cut down by the leaden hail. He saw the dun smoke of battle so dark that the cannon flashed red through it as at night. He saw the red-hot rebels charging through this hell mist to meet men as dauntless as themselves.

Then one of his aides, who had served with him in the West, said to him: "General! Do you think we can tie to these fellows?" Grant, after gazing for a long time grimly at the scene, answered slowly and deliberately; "Yes, they will do."

By their own admission the Confederates lost twenty-one thousand men in the battles of the Wilderness and Spottsylvania. Phisterer gives our loss in the two battles as 30,951. Southern sympathizers have always underestimated the Confederate loss, and in no instance so grossly as in reference to these engagements. Their loss, counting their stragglers and deserters, was as heavy as our own. But whatever their exact loss, it was far heavier than they could afford. Unquestionably they felt it far more than they would have done in the previous campaign. Their loss in battle alone during 1863 was 123,320. When their loss from sickness and desertion is counted in, it is evident that the loss of twenty-five or thirty thousand of their best troops in their best army was a staggering blow. They had no resources to fall back on. The South was exhausted. Reinforcements were sent to Lee under Breckinridge, Beauregard and Hardee, but they did not compensate for the loss sustained. From that time on there was a loss of spirit and dash that was manifest.

When on May 19th, Grant withdrew the corps on his right to continue the flank movement to the left, Ewell made a counter-attack. The first brunt of his charge was met by some green troops under Tyler and a colored division of Ferrero. To the surprise of the army, Ewell's attack was easily repulsed. The surprise was in this, that this was Jackson's old corps which two years before would have dashed over such troops like a raging torrent.

Grant says in his memoirs that Lee had, a few days later at the North Anna, a great opportunity for a counter stroke, which he neglected. The Rebellion Records now prove conclusively that Lee's loss had been too heavy. For three years the Confederates had been paying too dearly even for their victories. When Lee failed in his attempt to retake the bloody angle at Spottsylvania and saw Johnson's whole division marched off as prisoners of war before his eyes, he must have known that the fate of the Confederacy was sealed from that day and hour.

There was no *sauve qui peut* flight, no dramatic crisis, but thoughtful men in the South then realized that the Confederacy was a shell and that from that time on they would have to rob

the cradle and the grave to fill their ranks. It has often been said, and perhaps truly, that the fall of Atlanta and the battle of Cedar Creek did more to discourage the South and to give confidence to the North than any other battles. But from a military standpoint Chattanooga in the West, and Spottsylvania in the East, were the decisive battles, while Nashville was the *coup de grace*. As to the Virginia campaign there is a convincing consideration. When the Army of the Potomac crossed the James and invested Petersburg, it was open to Lee to march on Washington. Can any one doubt that he would have done so, if he had commanded such an army in August as he did in April?

After the war I met a commission merchant in Richmond (a Mr. Tardy), who had made a large fortune during the contest, while by far the larger number of business men in the South were bankrupt or impoverished. I asked this shrewd financier why he had been so fortunate. He told me that he had begun to *hedge* as soon as Grant "got out of the Wilderness." He explained further that soon after Spottsylvania, Confederate money became almost worthless and that he had invested all his savings in gold or land. During the reconstruction times in the South, as I was one of the Commissioners of Registration, I had many opportunities of talking with leading Confederate officers and rebel politicians. I asked very many of them when they began to despair of their cause. Many different answers were returned. Some said, "when the blockade was made effectual;" some, "when Vicksburg fell," others said, "when the darkies went back on them." But the greater number confessed that they began to lose hope when Grant invested Petersburg. In all my talks with them I never heard a Southerner ever mention Gettysburg as the turning point in the war. If that battle had not been coincident with the opening of the Mississippi River, it would have been regarded by the Confederates only as an unfortunate episode.

The price of gold rose in New York City for just a year after Gettysburg was fought. Then it began to fall steadily and surely as our success became assured. On the other hand Confederate securities became almost worthless when the Army of the Potomac crossed the James River and Sherman took Atlanta.

Pray consider what would have been the result, had the Federal armies been defeated at Chattanooga or in the Wilderness.

Providentially the Union might have been saved, but from a military standpoint its cause would have been desperate.

From these facts and considerations it is submitted, that there can be but this obvious conclusion: that Gettysburg was not the decisive battle of the War.

ARTILLERY SERVICE IN THE WAR OF THE REBELLION.

By BVT. BRIG.-GEN. J. C. TIDBALL, U. S. ARMY.

(Continued from JOURNAL, No. 54.)

IV.

AFTER the battle of Fredericksburg the Army of the Potomac remained encamped on the Heights of Stafford, facing Lee's army, which continued to occupy the heights and country in rear of Fredericksburg.

A number of important changes took place during the winter in the former army. Burnside, upon being relieved, was assigned to the command of the Department of the Ohio, and took with him his old corps—the Ninth. This was replaced by the Eleventh, composed largely of German troops, who idolized Sigel, their former commander, but who, being relieved, was now succeeded by Howard. The Twelfth Corps, which after the battle of Antietam, had been left behind to guard the Upper Potomac, now rejoined, and was commanded by Slocum. The other corps remained as before, but some changes took place among their commanders. Reynolds remained in command of the First, and Couch of the Second. Sickles was assigned to command the Third, vice Stoneman placed in command of the cavalry, now organized into a corps. Meade was assigned to command the Fifth, vice Butterfield made chief of staff of the new commander of the Army of the Potomac.

Sedgwick was assigned to the Sixth, vice "Baldy" Smith who, together with Franklin, had been relieved from duty with this army in consequence of the dissatisfaction found with them by Burnside concerning the battle of Fredericksburg. Sedgwick continued the reliable commander of the Sixth until he was killed at its head at Spottsylvania two years afterwards. Reynolds was killed at the head of the First, at Gettysburg, in the following July. Sumner, the veteran commander of the Second Corps from the date of its organization until he was assigned to the command of the Right Grand Division at the battle of Fredericksburg, had died. Hunt continued the able chief of artillery.

The organization of the artillery continued as before, *i. e.*, the batteries, except those of the Artillery Reserve, remained assigned to divisions, and, as a rule, without other than their own captains to command them. The Artillery Reserve was reduced to twelve batteries. Its former excellent commander, Colonel Hays, had received well deserved promotion to a brigadier-generalcy, and was assigned to an *infantry* command. The Reserve was now under a captain.

General Hunt, in his report of the operations of the artillery in the Chancellorsville campaign, says: "It will, perhaps, hardly be believed that for the command and management in their operations of the artillery of this army, consisting of 412 guns, 980 artillery carriages, 9543 men and officers, and 8544 horses, besides their large ammunition trains, there were but five field officers of artillery in the army, and from the scarcity of officers of inferior grades these officers had miserably insufficient staffs."

In number of officers and men alone this command was equal to an ordinary division of infantry with a major-general for its commander, together with three brigadiers and about thirty-five colonels and other regimental field officers. The comparison requires no comment. This anomalous state of affairs arose from the causes explained by General Hunt in his paper published in the number of this journal for March, 1891.

The grand division organization of Burnside was abandoned and the army returned to the *corps d'armée* as its highest unit.

The Army of the Potomac thus organized was recruited up to about 124,000 men, present and absent, or about 100,000 actually for battle; all armed, equipped, clothed, and in every way supplied to the fullest completeness. Hooker was not far wrong when he boastfully remarked that it was "the finest army on this planet." This was on the eve of still another disastrous campaign—that of Chancellorsville—a campaign in which it is safe to say that the artillery, despite the many disadvantages imposed upon it, saved this noble army from utter disaster.

The Army of Northern Virginia, still commanded by Lee, with his two reliable lieutenants,—Longstreet and "Stonewall" Jackson—continued to hold the heights behind Fredericksburg, and on each side of it from Port Royal, twelve miles below, to the United States Ford about the same distance above. This entire distance was covered by an almost continuous line of infantry parapets, interspersed with which were battery epaulments

advantageously located for sweeping the hill-slopes and bottom lands over which the Federal troops would have to march to the assault, and which effectually protected the artillery with which they were abundantly supplied. Abattis, entanglements, and rifle-pits covered the entire front. Lee's troops were so disposed along this line as to be readily concentrated at any threatened point. So secure, indeed, did Lee feel in his position, that he detached Longstreet with half of his corps to operate beyond the James River in the direction of Suffolk. Longstreet did not return until after the battle of Chancellorsville.

The experience of Burnside had demonstrated the futility of crossing and attempting to carry the enemy's position by a front attack. For various reasons it was impracticable to attempt to turn his right. Hooker therefore decided to make demonstrations at Fredericksburg with a portion of his army, as if to repeat the operations of Burnside, and with the remainder and larger part, march up the river to Kelley's Ford, distant about twenty-five miles, cross over, and, sweeping down in rear of Lee, force him to come out of his intrenchments and either give battle or retreat. The First and Sixth Corps, under Reynolds and Sedgwick respectively, together with Gibbon's Division of the Second Corps, were left behind to make the demonstrations, while the Third, Fifth, Eleventh and Twelfth, and the remainder of the Second, engaged in the turning movement. The cavalry, with the exception of one small brigade, had been started a few days previously on a raid under Stoneman and Averill to cut Lee's lines of communication. A couple of horse batteries accompanied these raiding parties.

Kelley's Ford is several miles above the confluence of the Rapidan with the Rappahannock, and this involved the crossing of the former after crossing the latter stream. It enters the Rappahannock on the south, or Fredericksburg side, and the tract of country included in the angle after crossing the Rapidan, is known as the Wilderness, a most appropriate name. It was here that Grant first met Lee in the spring of the following year and it was here, partly on the same ground, that Hooker was now to meet the same enemy. It is a slightly rolling country, covered with pine and oak forest, thickly interspersed with black-jack and other scrub growths. The clayey soil is so barren as to have induced but few settlements and they of the poorest sort.

Chancellorsville, one of these settlements consisting of but

one house, owes its importance to the meeting here of two or three roads. Around this house is an irregular cleared space of about one hundred acres. From here to Fredericksburg, distant about ten miles, are two good roads, which, some four miles from Chancellorsville, emerge into a more open country around and about Salem Church, soon to become famous as the place where Sedgwick with his Sixth Corps made such a stout resistance to an overwhelming force of Lee's army. One of these roads, known as the Fredericksburg and Orange plank road, after passing the Chancellor house continues on westward towards the Rapidan. About two miles from the Chancellor house it again branches, and at this point is another cleared space of about a hundred acres, with several houses near by, one of which was known as Melzi Chancellor's, or "Dowdell's Tavern." It was here that the Eleventh Corps was stationed on the evening of May 2d, when Jackson made his flank attack and sent it flying to the rear. This was the turning point of the battle and of the campaign.

Through the forest, in various directions, are country roads with here and there a clearing and a house. The Fredericksburg and Orange plank road, running by the Chancellor house, follows, in quite a straight east and west course, the undulating crest of a low, almost imperceptible ridge.

As the principal part of the battle was fought along this road, or within a short distance of it on either side, for a distance of about three miles, it may be taken as the axis of the field and everything referred to it as an ordinate.

On this road about three-fourths of a mile west of the Chancellor house, is a slight eminence known as Fairview; beyond which, at about the same distance, another slight eminence and opening called Hazel Grove. In the depression between these eminences is a small brook, running southwardly, a tributary of Mine Run. On another swell of ground, a mile or so beyond Hazel Grove, is Dowdell's Tavern; and half a mile beyond this, on still another rise of ground, is the Tully farm-house, beyond which the right of the Eleventh Corps extended about half a mile, and rested in the depths of the forest. This was the extreme right of Hooker's line; beyond it he did not have even a picket-guard.

Hazel Grove became a place of great importance as a position for the Confederate artillery, while that of Fairview was of equal im-

portance for the Federal batteries. The position at the Chancellor house was all important to Hooker, because of the roads converging to it. With this position in the hands of the enemy, he would be cut off in every direction except towards the United States Ford about three miles in rear of Chancellorsville; between which two places was a common country road running through dense forest. This ford was guarded by Mahone's Brigade, with another near by in support. Upon the approach of Hooker's turning column these brigades, after slight resistance, withdrew, thus uncovering the ford. Here a pontoon bridge was at once laid, establishing communication directly with the position opposite Fredericksburg, and uniting, in a measure, the two wings of Hooker's army. The Second Corps (excepting Gibbon's Division) being near at hand, at once crossed at this bridge, and joined those already at Chancellorsville.

To the eastward of the Chancellor house, and within easy artillery range, was slightly higher ground, and also some in front, all of which the enemy took advantage of to assail the position. Dense forest surrounded the fields at the Chancellor house. The distance from wood to wood across these fields in every direction was less than easy musket range, thus affording the enemy the advantage of that kind of cover so congenial to him. Every road and path through this wilderness was familiar to the enemy, while they were entirely unknown to Hooker's troops.

About halfway between the United States Ford and Fredericksburg is Banks' Ford, which, owing to a bend in the river, is only about four miles in a straight line from the latter place. The steep bluffs about this ford were covered with rifle pits held by Wilcox's Brigade of Anderson's Division. It was expected that Hooker's advance from Chancellorsville would cause Wilcox to withdraw, when another bridge would be laid, thus virtually connecting both wings of the army. For the purpose of assisting in this operation, and also of guarding against the contingency of the ford being used by the enemy in giving a counter blow, a battery of 36 pieces, chiefly batteries of the Reserve, under Captain Graham, were posted here and did good service. Wilcox was driven away and a bridge constructed, to which Sedgwick fought his way and made good his retreat to the north side.

The Chancellorsville campaign opened on the morning of April 27, 1863, when the troops of the Army of the Potomac were put in motion for the various operations just indicated.

The turning movement was so skillfully made that by the afternoon of the 30th Hooker had assembled at and near Chancellorsville the Second, Fifth, Eleventh, and Twelfth Corps, while the Third was near at hand and could reach the place within a few hours. While these movements were being executed others were in progress at Fredericksburg, where it will be remembered, Hooker had left Sedgwick and Reynolds to attract Lee's attention, and by misleading him hold him in his intrenchments until the flanking movement could be got well under way.

The arrangements for crossing these two corps were very similar to those employed by Burnside for crossing a few months before. At one of the bridges, below the town, was posted a battery of 34 pieces, chiefly rifles, under Col. Wainwright, chief of artillery of the First Corps. It is proper here to mention that this corps was left behind for the purpose of making demonstrations, or of assisting Sedgwick in a real attack, as the case might require. One of its divisions crossed over, but was soon recalled, and the whole corps hastened to Chancellorsville where things were assuming a very unfavorable aspect.

At the other bridge, where Sedgwick was to cross, another battery of 46 pieces, chiefly rifles also, was posted under Colonel Tompkins, chief of artillery of the Sixth Corps.

In laying the bridges at both of these crossings, considerable opposition was met with from the enemy sheltered in rifle pits on the opposite side. A well-directed fire from some of the guns soon, however, cleared him away.

Still further down the river, nearly opposite the mouth of the Massaponax, another battery of 16 rifles was posted under Colonel Warner, inspector of artillery. These guns were to command the bridge over the Massaponax and the valley of that stream to prevent the enemy from turning that flank and taking Sedgwick in reverse. As he advanced towards the town these guns followed up the movement along the opposite shore. In addition to the foregoing groups of guns, five batteries of Napoleons were stationed near Falmouth, in readiness for service at any point required.

The batteries posted at the several crossings had numerous duels with the enemy's artillery, in which but little good resulted, except as affording excellent lessons in practical gunnery. All of these admirable dispositions of batteries were made under the supervision of General Hunt, whose functions, as chief of artillery, had been curtailed almost exclusively to this duty.

As the operations at the crossings near Fredericksburg ceased to require their presence, many of the batteries were hastened up to assist at Chancellorsville.

Hooker's flanking movement would, of necessity, call Lee from his intrenchments; seeing which, Sedgwick was to force his way through whatever force might be left on the heights back of the town and attack Lee in rear, while the latter should be engaged with Hooker. Sedgwick carried out his part of this programme most successfully up to the point where Hooker was to engage Lee. Here Hooker failed him; and Lee, turning an overwhelming face against Sedgwick, forced the latter to retire across the river at Banks' Ford.

As has already been stated, Hooker's turning column arrived at Chancellorsville on the afternoon of April 30. Hooker was with it in person. At this time Lee had not moved from his position at Fredericksburg, and Hooker's great mistake was in not continuing to move forward to gain possession of the open ground about Salem Church, where his artillery would have had a better chance, and which would have uncovered the position at Banks' Ford for the laying of a bridge. An advance of four miles that afternoon or early next morning would have put him in possession of all these advantages. As it was he made no movement until late in the forenoon of the following day, by which time Lee had taken possession of the ground, and was able to hold it. At the time referred to, Hooker sent, or rather started, a reconnoissance in force down the three roads leading to Fredericksburg, which movement was to be preparatory to a simultaneous advance in that direction by his entire force about 2 P. M.

The troops for this reconnoissance consisted of the entire infantry of two corps—the Fifth and Twelfth—but, strange to say, of all the thirteen batteries then present with these corps only four were to accompany the expedition.

The object of a reconnoissance in force is to push the enemy to a degree just short of a general engagement with a view to determine his strength and dispositions. It is manifest that artillery is preëminently the arm best adapted for this purpose.

In this instance the reconnoissance was recalled before becoming seriously engaged, except as to Sykes' Division of the Fifth Corps, which was on the "Old Turnpike," a road intermediate between the Plank Road upon which was the Twelfth Corps, and the River Road where marched the other two divisions of the

Fifth. On gaining the ridge, about a mile from Chancellorsville, Sykes discovered the enemy advancing in force. Deploying rapidly, and thinking himself supported on both flanks by the troops on the other roads, he pushed forward his line and gained the next ridge in advance, which he stubbornly held until recalled about two hours afterwards. While doing this he could hear nothing of his supports on the other roads. His flanks were becoming enveloped by the enemy and he was in truly a critical condition, when Hancock with his division of the Second Corps was sent to assist him in retiring with safety. Hooker had learned, through other sources, of the advance of the enemy and had recalled the reconnoissance; but by some blunder Sykes had not been informed of it. Blunders, from this time on, came thick and fast. Up to this point everything had gone well. Hooker's plan for flanking Lee out of his strong position was admirably conceived, and the execution of it, up to this period, was skilfully managed. But Hooker now seems to have been greatly astonished that Lee should confront him so boldly, and at once decided to abandon the initiative and stand upon the defensive, a decision that threw every advantage into the hands of his adversary, and these advantages were numerous.

Sykes, in the sharp affair just mentioned, was ably supported by Weed's battery of the 5th U. S. Artillery. In fact it is doubtful, taking the enemy's account, if he could have held the position as he did, until the arrival of Hancock, without the efficient service of this battery.

The enemy advanced and immediately commenced feeling Hooker's position, during which operation there was considerable desultory artillery practice. "Jeb" Stuart, with his cavalry, closely reconnoitred the whole of Hooker's line from left to right, and reported to Lee the vulnerable condition of Hooker's right flank; that it was entirely in the air and easily reached.

Hooker had established his line with the left resting on the Rappahannock, about a mile below the United States Ford, at which ford were his pontoon bridges connecting him with his base which was still at Falmouth opposite Fredericksburg. The left was held by the Fifth Corps, which, extending out perpendicularly to the river, joined on to the Second; which, crossing the Orange Plank Road, curved around in front of the Chancellor house almost to the same road on the other side where its right connected with the left of the Twelfth. This latter corps, ex-

tending along in front of the road, and passing over the Fairview elevation, joined the left of the Eleventh near Hazel Grove; from which point the latter corps extended past Dowell's Tavern, over the rise at the Tully house and into the depths of the forest beyond. This attenuated line was necessarily very thin, but was supported by the Third Corps, which, arriving by the United States Ford on the evening of the 1st, took an active part in repulsing the enemy when feeling Hooker's position on the following day. Birney's and Whipple's divisions of this corps took position between the Eleventh and Twelfth. The other division rested in support of a thin part of the line between the Second and Twelfth Corps.

Five batteries of 30 guns of the Fifth Corps were massed, under Captain Randol, on a knoll near the river to cover the approach to the United States Ford by the River Road. When the Twelfth Corps returned from the reconnoissance before mentioned, its batteries were grouped in position near the Chancellor house by Captain Best, chief of artillery of this corps. Hooker had upon the field, at this time, 35 batteries of about 200 guns; but, with the exception of the two groups just mentioned—about 60 pieces—all the other batteries were scattered—distributed in the usual manner to divisions. "The woods seemed full of batteries." Hancock, who with his division of the Second Corps stood across the main road to Fredericksburg, the most exposed position on the field, says:

"A section (*two pieces*) of artillery was placed on the turnpike, where my line of battle crossed it, and one piece in a wood-road nearly parallel to it and about 200 yards to the left." This was all that was at this important point. What he reports was very good for an advanced guard, but entirely inadequate as against the ponderous blows soon to be dealt by the enemy, and which pulverized this part of the Union line.

On the extreme right, where Jackson made his furious onslaught, the commanding general of the Eleventh Corps, after describing in his report the positions of his infantry, says: "The artillery was disposed as follows: Two pieces near General Devens' right, enfilading the old turnpike; the rest of Dieckmann's battery on the left of General Devens, covering approaches along the Plank Road. Four guns of Wiedrich's battery were placed near Steinwehr's right, and two guns near his left, covering the approaches from the front. Dilger's battery was posted near the

intersection of the turnpike and the plank road. Three batteries were in reserve and so placed as to be used on any of the approaches."

The right of the Eleventh Corps, which was Hooker's extreme right, rested on no natural object to prevent it from being readily turned and broken by even the slightest attack. It should therefore have been strengthened by the formation of an artificial object. The batteries, lying idle in the woods, furnished means for this. The right of the Eleventh, instead of losing itself in the woods, should have been drawn back to cover the flank and rear, and the angle thus formed strengthened by a *mass* of guns. Devens, who commanded the right division of the Eleventh, permitted Von Gilsa, commanding his right brigade, to draw back two of his small regiments; but the angle was strengthened by only the two pieces mentioned in the report of the corps commander. The sequel showed how utterly inadequate was this preparation for such an attack as Jackson was about to make.

Hooker had dispensed with the services of his chief of artillery, and there was no one upon the field to make proper disposition of the batteries. The senior battery commander in each corps was its chief of artillery, and exercised a nominal control over its batteries, but there was no one to take a comprehensive view of the entire field and distribute the batteries where most needed. As a rule, the batteries stuck as closely as possible to their divisions, but in a country so wooded this necessarily threw many of them into positions where they could be of but little service—often of no service whatever.

The line of battle thus formed, extending from the Rappahannock on the left, around in front of the Chancellor house, and thence on along the Orange Plank Road to the woods beyond the Tully house, was strengthened, as rapidly as possible, by each division, brigade or regiment according to its own ideas of military engineering.

While this was going on at Chancellorsville bridges had been laid below Fredericksburg, and the Sixth Corps and part of the First crossed over to make demonstrations. These had the desired effect of confusing Lee and diverting his attention until after the turning column had crossed the Rapidan and was well on its way to Chancellorsville. Lee in his report says: "The enemy in our front near Fredericksburg continued inactive, and it was now apparent that the main attack would be made upon

our flank and rear. It was, therefore, determined to leave sufficient troops to hold our lines, and with the main body of the army to give battle to the approaching columns. Early's Division of Jackson's Corps, and Barksdale's Brigade of McLaws' Division, with part of the reserve artillery under General Pendleton, were intrusted with the defense of our position at Fredericksburg, and, at midnight on the 30th, General McLaws marched with the rest of his command toward Chancellorsville. General Jackson followed at dawn next morning with the remaining divisions of his corps. He reached the position occupied by General Anderson (where Sykes met him) at 8 A. M., and immediately began preparations to advance."

It was knowledge of this advance and preparation for attack that caused Hooker to decide to stand upon the defensive.

Lee, after describing the resistance received from Sykes, goes on to say: "Here (at Chancellorsville) the enemy had assumed a position of great natural strength, surrounded on all sides by a dense forest filled with tangled undergrowth, in the midst of which breastworks of logs had been constructed, with trees felled in front, so as to form an almost impenetrable abattis. His artillery swept the few narrow roads by which his position could be approached from the front, and commanded the adjacent woods. * * * Darkness was approaching before the strength and extent of his line could be ascertained, and as the nature of the country rendered it hazardous to attack by night, our troops were halted and formed in line of battle in front of Chancellorsville at right angles to the Plank Road. * * * It was evident that a direct attack upon the enemy would be attended with great difficulty and loss, in view of the strength of his position and his superiority of numbers. It was, therefore, resolved to endeavor to turn his right flank and gain his rear, leaving a force in front to hold him in check and conceal the movement. The execution of this plan was intrusted to Lieutenant-General Jackson with his three divisions. * * * Early on the morning of the 2d, General Jackson marched by the Furnace and Brock roads, his movement being effectually covered by Fitzhugh Lee's cavalry, under General Stuart in person."

Lee here speaks of Hooker's artillery being posted to sweep the roads and command the adjacent woods. He was in a measure mistaken in this, misled, no doubt, by the fact that such should have been the case, and would have been had the Federal artillery

been under the same system of command that existed in his army. As a preliminary to this unfortunate campaign, Hooker had deprived his faithful and skillful chief of artillery—General Hunt—of all except administrative control over the artillery, and had placed no one in the actual command. The artillery on that field was literally without a head ; and it was, too, a field which, on account of its peculiar topographical features, preëminently demanded a head ; and not only a head, but, from the head down to the individual battery, a proper gradation of command and supervision.

There was no one upon the field whose special business it was to look for eligible positions for batteries, and having found them, with authority to post them there, and to command them when so posted ; to select rifle batteries for positions requiring such pieces, and smooth-bores for service adapted to their kind. It was not until after disaster had befallen his army and everything was in confusion, that Hooker recalled his chief of artillery, and invested him with authority to restore order. If what was then done as a restorative, had before been done as a preventive, the probabilities are that Chancellorsville would have had another and entirely different history.

Jackson, to reach Hooker's right flank, had to pass across the entire front of the latter. At one point, near "The Furnace" where there was an opening through the woods, his column was distinctly visible, passing in an uninterrupted flow for three hours and more. Birney, commanding one of the divisions of the Third Corps, sent a battery to an open space in his front, where, opening fire, it produced considerable confusion in the enemy's ranks by its excellent practice. The column, however, continued to move on, and about noon, Sickles, obtaining permission from Hooker, moved out with the divisions of Birney and Whipple of his corps, and Barlow's Brigade from the Eleventh, to ascertain the nature of it. Williams' Division of the Twelfth Corps supported Sickles' movement on the left. Altogether a force of 42 regiments took part in this movement, but, strange to say, not a piece of artillery. Three batteries of Whipple's Division were left behind in an open field at Hazel Grove. Here, subsequently, they were joined by Martin's Sixth New York Horse Battery, in all 22 pieces. A collection of forges, battery-wagons, and ambulances were left on a cart-road through the woods a little to the westward of the field in which stood the batteries.

In approaching the road upon which Jackson's column was passing, Sickles' force met the flankers of the column, with whom it commenced a brisk skirmish, and captured two or three hundred prisoners. But the enemy, opening with artillery, checked further operations until a battery could be sent for and brought up from those left behind. By this time the rear of the column had passed, and the opportunity of cutting it off or seriously damaging it was lost. This was another instance of service the nature of which preëminently demanded the presence of artillery.

Jackson, pursuing his westerly course until beyond the right flank of Hooker's line, turned sharp to his right, and continued this course until he was squarely across, and considerably in rear of, the right flank of the Eleventh Corps, and about a mile from its extreme end. Here, in an opening in the forest, he formed his three heavy divisions into a powerful column of attack. In the front line was Rodes' Division; in the second Colston's, and in the third that of A. P. Hill, with about one hundred yards distance between the lines. The artillery took such positions on the flanks as the wooded nature of the country permitted. This column was to move ahead, driving everything before it, and the position at Talley's house was to be carried at all hazards. After taking the high ground at this point, overlooking that further on about the Dowdell Tavern, should determined resistance be met with, the column was to halt until artillery could be brought up, to force the way for further advance.

The troops thus to be struck were those of the Eleventh Corps, commanded by Howard; an organization that had experienced considerable desultory service under Sigel, but, as yet, was unfamiliar with the solid fighting of the Army of the Potomac.

It consisted of three divisions of two brigades each, comprising in all 26 regiments, or about 10,000 men actually present for duty. The corps occupied a front of nearly two miles, making the line necessarily thin and weak. Along this entire distance but sixteen guns were in position. Three other batteries, of eighteen pieces, were in park near at hand; but, as it turned out, only a few shots were fired from these before they joined the fugitives to the rear.

As the failure of the campaign seems to hinge upon what took place in this corps, it is pardonable to particularize. The right division was commanded by Devens, whose right brigade, that of

Colonel Von Gilsa, had its two right regiments (consisting of only about 700 muskets) thrown back at right angles to the main line, and covered by slight breastworks. In the angle thus formed two pieces of artillery were posted to enfilade the road, here passing through dense woods. This short line of Von Gilsa was the first encountered by Jackson's column, and figures in the Confederate reports as something formidable. The two guns in the angle fell into the hands of the enemy. On the left of Devens' Division, about half a mile from the angle just mentioned, were the other four guns of the same battery. These pieces did not fire at all, but withdrew early.

Next to Devens' Division came that of Schurz, a few of whose regiments were in line connecting properly with Devens' left. Schurz, being convinced from what he could see and hear of the enemy's movements towards the right that an attack was to be apprehended, placed some of his regiments so as to face in that direction, and these, covering themselves with slight intrenchments, formed another obstacle which figures in the reports of the enemy as a formidable line. Near where the right of Schurz's line rested, the Orange Plank Road branches off towards the southwest, and here Dilger's battery was posted, commanding this road and some open ground around it. When the attack was opened, Dilger withdrew his battery to some higher ground a short distance to his rear, where he could have a better field of fire to resist the enemy, now pouring in from the right. As soon as his front was clear of fugitives, he opened on the advancing enemy with canister, and did good execution until the enemy were almost among his pieces. Owing to the killing of many of his horses he lost several of his pieces. Near him were four guns of Wiedrich's battery; these stood their ground also, but lost some pieces from the same cause.

On the left of Schurz was one brigade of Steinwehr's Division; the other brigade, that of Barlow, had been sent to the front to assist the divisions of the Third Corps in cutting the tail of Jackson's column. Steinwehr's Brigade had two regiments deployed to the front; the other two were in rear undeployed. Directly in rear of this brigade the three spare batteries of the corps were parked in a line perpendicular to the main line of battle. Some scattering intrenchments had been thrown up in front of these batteries and along their flanks. Behind these intrenchments quite a number of fugitives were rallied, and for a short time

made some resistance, and the batteries also did some firing. This line also is mentioned in the Confederate reports as constituting a formidable obstacle.

From the left of the Eleventh Corps to the right of the Twelfth was an interval of about three-fourths of a mile, intended to be occupied by the two divisions of the Third Corps now in front in pursuit of Jackson's column. As has been stated, these divisions left their batteries behind when they moved to the front. Some of those of Birney's Division were in the way of the fugitives of the Eleventh Corps and, being overrun and thrown into confusion, lost much of their material. The three batteries of Whipple's Division, left in the open ground about Hazel Grove, were in position to do invaluable service in checking the enemy at the moment when in full tide of success.

Jackson's three divisions numbered 70 regiments, against which Howard had but 22. Barlow's Brigade of four regiments, it will be remembered, had been sent out with Sickles. At this time the Confederate regiments were numerically stronger than those of the Federals, owing to the fact that their system of conscription was now in force in all its rigor, by which the old regiments were filled up, as was *not* the case with their opponents. Jackson had 65 guns, Howard but 34. It will thus be seen, that with this great disparity of force against him, Howard, unsupported as he was, had but slender chance of making a successful resistance. Even with the preparations that should have been made to meet the attack the chances were largely against him.

At about 5.30 P. M. Jackson set his column of attack in motion, and, brushing aside the few pickets met with, soon came upon Von Gilsa's two regiments forming the short line in rear of Devens' right. Rodes, commanding Jackson's leading division, says of this: "At once the line of battle moved forward with a yell, and Doles' Brigade at this moment debouched from the woods and encountered a force of the enemy and a battery of two guns intrenched. Detaching two regiments to flank the position, he charged without halting, sweeping everything before him, and, passing on to Talley's, gallantly carried the works there, and captured five guns by a similar flank movement of a portion of his command. So complete was the whole manœuvre, and such was the surprise of the enemy, that scarcely any organized resistance was met with after the first volley was fired. * * * The larger portion of his force, as well as his intrenchments, were

drawn up at right angles to our line, and, being thus taken in the flank and rear, they did not wait for the attack. On reaching the ridge at Melzi Chancellor's (Dowdell's Tavern), which had an extended line of works facing in our direction, (those by the spare batteries, before mentioned) an effort was made to check the fleeing columns. For a few moments they held this position, but once more my gallant troops dashed at them with a wild shout, and, firing a hasty volley, they continued their headlong flight to Chancellorsville. It was at this point that Colston's line, which had followed closely on my rear, went over the works with my men, and from this time until the close of the engagement the two divisions were mingled together in inextricable confusion."

A short distance beyond this, Jackson's troops entered a thick wood and his right flank came opposite the open ground at Hazel Grove in which were the three batteries of Whipple's Division of the Third Corps, and Martin's horse battery.

Howard, in describing this attack, says: "At about 6 P. M. I was at my headquarters, at Dowdell's Tavern, when the attack commenced. I sent my chief of staff to the front when firing was heard. General Schurz, who was with me, at once left to take command of his line. It was not three minutes before I followed. When I reached General Schurz's command I saw that the enemy had enveloped my right and that the First Division was giving way."

A spirited resistance was made by some portions of this corps, but soon a great part of it gave way in blind panic and confusion—infantry and artillery—overrunning everything in their flight. These fugitives, rushing through a battery and some caissons of another battery of Birney's Division, then at the front, threw them into such confusion as to cause them to fall into the hands of the enemy. The battery wagons, forges and ambulance standing, as before mentioned, in the cart-road through the woods to the westward of Hazel Grove, stampeded, and rushing through the batteries in that field threw these likewise into temporary confusion; but through the exertions of the battery officers and the steadiness and discipline of the men, the stampede was not communicated to the batteries. As soon as the torrent of fugitives had passed, the guns of these batteries opened with canister on the enemy, now making his way into the field. This fire, evidently unexpected, caused the enemy to retire hastily to the cover of the woods from which they had just emerged, and from which

they at once opened a heavy fire of musketry. The enemy, advancing through the woods between the field and the plank road, enfiladed the batteries, causing some of them to change the direction of their fire to that quarter, and thus enfilade the line of the enemy. In this manner these batteries, entirely alone and unsupported, maintained their position, holding the enemy in check until the arrival, a considerable time afterwards, of Birney's and Whipple's divisions from the front.

It was the unexpected shock of this artillery fire that staggered the enemy. Nothing but the timely and gallant conduct of these batteries prevented the enemy from gaining the flank and rear of the Twelfth Corps as he had done that of the Eleventh. The batteries that did this invaluable service were Huntington's "H," 1st Ohio, and the Tenth and Eleventh New York Independent batteries, commanded on this occasion by Lieutenants Lewis and Burton, respectively. Captain Huntington, as senior officer exercised general supervision over the whole. Martin's horse battery, the 6th New York, of four pieces, acted in conjunction with the others. It had been left there by the cavalry, which had gone by detachments for duty in other parts of the field. One of these detachments was the Eighth Pennsylvania, under command of Major Huey, which being ordered to report to General Howard, ran unexpectedly into the enemy, whom it charged with a vim and gallantry not excelled even by the charge of "The Six Hundred."

The enemy was completely and thoroughly checked by these batteries. Sickles, being informed of Jackson's attack and of the rout of the Eleventh Corps, hastily returned with his two divisions and took position with them at Hazel Grove, and assisted in holding this important position until withdrawn next morning.

The two front lines of the enemy had become intermingled by the time they had reached the point opposite Hazel Grove, and great confusion now existed in their ranks. Hill's Division, comparatively intact, constituting the rear line, was now advanced to the front and the other two withdrawn, to reform in the open fields about Dowdell's Tavern.

While this was going on, Jackson, with a numerous retinue of staff officers and orderlies, rode down the road towards Chancellorsville to examine the position in that direction. When returning, his own troops, mistaking his party in the obscurity of the

evening for a body of Federal cavalry, poured into it a heavy volley of musketry, mortally wounding Jackson and tearing his escort to fragments. This firing caused the Federal troops to open with full force, and for a time the musketry and cannonade was terrific, most of which came from the Twelfth Corps, which, with other troops, had now taken position to resist further advance of Jackson's column. Rodes says of this: "At this time the enemy opened a similar terrific fire of artillery to that which had taken place just before my withdrawal, which caused much confusion and disorder, rendering it necessary for me to place guards across the road to stop stragglers." In this fire General A. P. Hill was wounded. He had just succeeded Jackson in command, after the wounding of the latter. After Hill, the command devolved upon "Jeb" Stuart, who, with a portion of his cavalry, had gone to one of the fords of the Rapidan, to meet Averell's cavalry approaching in that direction.

Up to this period the enemy, owing to the wooded nature of the country, had had but little opportunity of using his artillery. Colonel Carter, commanding Rodes' battalion of batteries says: "My artillery followed rapidly down the turnpike having no occasion to take position. After reaching Dowdell's, several pieces were put in position on both sides of the road in the intrenchments there formed, to repel an attack of the enemy should our lines be driven back at the woods just ahead." From here he advanced some pieces along the road, and in openings, to assist the infantry. He describes the artillery firing that occurred at the time Jackson and Hill were wounded as being very destructive upon his artillery near Dowdell's. During the night, the enemy's other artillery battalions came up and joined that of Carter.

Hill, who had advanced his division to the front, says of the fire which opened at the time Jackson was wounded: "The enemy during this time had concentrated a most terrible fire of artillery on the head of my division from 24 pieces of artillery." It was during this fire that A. P. Hill was wounded. These 24 guns were in reality 34, a battery assembled under Captain Best, chief of artillery of the Twelfth Corps, who on the previous day had collected the five batteries of his corps in a position near the Chancellor house, and thus had them in hand for this emergency.

Best, seeing what had happened to the Eleventh Corps on his right, says: "Having no doubt the enemy would follow in force,

I gathered all our batteries, save Knap's and Lieut. Muhlenberg's section, massing them on the ridge in rear of our First Division, and posting in position with them some of the fragments of the Eleventh Corps batteries, until I had 34 guns in what may be termed the key-point of the battle-field." The infantry in front of him was on lower ground, enabling him to fire successfully over their heads. "Up to near 10 o'clock at night," he continues, "the cannonading at intervals was terrific, and, in my opinion, contributed much to checking the bold and elated enemy. That night I intrenched all my guns, the digging subsequently proving much protection."

Two divisions of the Twelfth and one of the Third Corps were formed in line across the plank road in the low ground in front of Best's batteries. This formed a new line facing westward, the direction from which Jackson's column was approaching. This made a right angle with the part facing south, and continued in an irregular curve around in front of the Chancellor house, and thence on to the river about a mile below the United States Ford. At the angle was the high ground known as Fairview, and here was where Best had his batteries. Hazel Grove was to the left and front of this, and, during the night, Sickles, occupying the latter position, thought himself entirely cut off from the main body. Close in front of Hazel Grove the enemy occupied the breastworks from which the Eleventh Corps had been driven. About midnight Sickles made a bold attack, resulting in a good deal of consternation to the enemy and the recovery of some of the artillery and débris of the battle of the evening before. After this everything remained quiet until early morning.

While these things were transpiring on the right of Hooker's line, Lee, in person, was directing vigorous attacks on that part of the line around the Chancellor house. Of this, Lee says: "As soon as the sound of cannon gave notice of Jackson's attack on the enemy's right, our troops in front of Chancellorsville were ordered to press him strongly on the left, to prevent reinforcements being sent to the point assailed. They were directed not to attack in force unless a favorable opportunity should present itself, and while continuing to cover the roads leading from their respective positions towards Chancellorsville, to incline to the left so as to connect with Jackson's right as he closed in upon the centre. These orders were well executed, our troops advancing up to the enemy's intrenchments, while several batteries played

with good effect upon his lines until prevented by the increasing darkness."

This part of Hooker's line was held chiefly by Hancock's and French's divisions of the Second Corps. Although the fighting was sharp the position remained unchanged. Hays' Brigade of French's Division was sent to the right of the new position of the Twelfth Corps, to strengthen that part of the line and prevent the enemy from getting in rear to the pontoon bridge at the United States Ford. Here it became severely engaged and Hays himself was captured. Up to within a short time before this he had, as lieutenant-colonel, ably commanded the artillery reserve.

The Eleventh Corps was thoroughly broken up and scattered through the woods in every direction. As fast as its fragments could be collected they were transferred to the extreme left to replace Meade's Corps—the Fifth—Sykes' Division of which was now brought over to the right flank to prevent the enemy from gaining possession of the road leading back to the pontoon bridge, which, once in the hands of the enemy, would have cut Hooker off entirely. During the night, the other two divisions of the Fifth were moved over in the same direction, thus forming the commencement of a new line near the "White House," about a mile in rear of the Chancellor house. Captain Randol's 30 guns of the Fifth Corps remained in position to cover the approaches to the pontoon bridge from the direction of Fredericksburg. As there was no attack made on this part of the line, these guns took no active part in the battle. The very fact of their being so favorably posted perhaps deterred the enemy from making an attack.

It will be observed from the foregoing, that after the rout of the Eleventh Corps, when the enemy was in full pursuit, and upon the verge of taking the Twelfth in flank and rear, as he had done the Eleventh, the firm stand made by Huntington's 22 guns held him in check, and enabled the Twelfth to make such arrangements as to hold him at bay until morning. After the wounding of Jackson and Hill, Stuart was called from a distant part of the field to command, and being unfamiliar with the condition of things, deemed it imprudent to continue operations in the dark.

As heretofore stated, the First Corps, under Reynolds, had been left at the crossing below Fredericksburg to assist Sedgwick, and had already one of its divisions over the river. On the morning of May 2d, Reynolds received orders to withdraw, take up the bridges and proceed, forthwith, to Chancellorsville. By

daylight of the 3d, he had his corps in position as directed, occupying the right of the new line established by the Fifth. The extreme right of the First was broken to the rear, and at the angle thus formed, were posted six 3-in. and twelve Napoleon guns. The enemy not attacking at this point, these guns were not engaged. The other six batteries of this corps were hastened forward to assist the troops, now heavily engaged near the Chancellor house. Most of them soon became hotly engaged also; and, although scattered about, here and there, did excellent service. Some of them met with unprecedented losses in officers and men.

This was the general arrangement of Hooker's line when the battle was resumed on the morning of the 3d. There was, however, much in detail about it that required rectifying, and putting in shape for the coming contest—matters so numerous that it was physically impossible for Hooker to attend to them all personally. He had left his chief of staff, General Butterfield, back at headquarters on Stafford Heights, and was, of course, without his valuable assistance. General Warren, his chief engineer officer, had gone to join Sedgwick at Fredericksburg, and there was no one but a *captain* left to fill his place, who, however active and accomplished, could have but little weight and official influence on a field swarming with general and other officers of rank and position. His chief artillery officer, General Hunt, was absent, by his order, attending to other business, and there was not even the shadow of any one else to fill that important position. The consequence of all this was, that when day dawned on the morning of the eventful 3d, the army had a general crazy-quilt appearance, little in accordance with the serious work before it, and in this the artillery had more than its proper share. The key-point of the whole position, that at the Chancellor house, was held by the Second Corps under Couch. Hancock still retained in position the three pieces previously mentioned, in addition to which two batteries were placed, during the previous evening, on his right. So little appreciation did Couch have of the value of artillery for holding such a position, that, during the night, he sent all his other batteries back to join his wagon train at the ford. Here it is not out of place to mention that one of the other corps commanders, when marching to Chancellorsville, expecting every moment to meet the enemy, caused his batteries to accompany his wagon-train, as part of the impedimenta, in-

stead of as a part of his fighting force, the *élan* and soldierly spirit of which it was important to maintain, although he might not perhaps want its service at the time. The control of artillery matters by its own officers was rendered so feeble by the vicious system of dispersion, whereby the command was vested in others, that such like occurrences were not at all unusual.

With the exception of the 34 guns which Best still held intact, there were none others that could be said to be fairly in position on any part of the line threatened with attack. Of the nine batteries of the Third Corps, a few were posted here and there as if on picket, but without concert or unity of action. Those of the Eleventh, stampeded on the previous evening, were chiefly scattered through the woods.

The most important part of the line was the position at Hazel Grove, where Sickles still remained with the divisions of Birney and Whipple and the twenty-two guns that had done such good service on the preceding afternoon. This position, slightly elevated, commanded that held by the enemy towards Dowell's, and that also of the Federals at Fairview and beyond, towards Chancellorsville. In possession of the enemy, it would enable Jackson's—now Stuart's—Corps to connect with the remainder of Lee's forces in front of the Chancellor house. Sickles represented to Hooker the importance of holding it, but the latter, thinking differently, ordered him to fall back from it early in the morning of the 3d. This was effected in good order, although not without some sharp fighting, in which Huntington lost four of his pieces, by having his horses disabled. The enemy at once crowned the position with artillery, which enfiladed the Federal front towards Chancellorsville, and had an oblique fire on the front running towards the river.

Stuart was busy during the night in putting his command in order to renew the attack at daylight. He says: "I sent Colonel E. P. Alexander, senior officer of artillery, to select and occupy with artillery, positions along the line bearing upon the enemy's positions, with which duty he was engaged all night." Certainly a strong contrast to what was *not* being done within Hooker's lines.

Owing to the wilderness nature of the country, and the few avenues of approach, Alexander was able to find positions for but seventeen pieces. The remaining forty-eight, in four battalions of batteries, were held in readiness to advance and take up posi-

tions where opportunity offered. In all he had sixty-five pieces.

When Stuart made his attack on the morning of the 3d, with his 70 regiments of infantry and the artillery just mentioned, he was confronted by the Third and Twelfth Corps, and Hays' Brigade of the Second, in all 74 regiments. But, for the reasons before stated, Stuart's regiments were stronger than those of his opponents, and it is therefore probable that he had the superiority in numbers; besides, Anderson soon made a junction with him, thus very considerably adding to his strength.

When the Third Corps united with the Twelfth at Fairview, six of its batteries were put in position to the right and left of Best's 34 gun battery, making in all 70 pieces. The Third Corps batteries were, however, somewhat scattered, and operated without concert of action. When Sickles withdrew his divisions and batteries from Hazel Grove, he took position with the Twelfth Corps at Fairview. Here some of the hottest fighting of the day took place. The skirmish which occurred when Sickles withdrew from Hazel Grove now grew into a furious battle. The attack of the enemy became general, not only on this part of the field but also on that part surrounding the Chancellor house. Lee sent in his entire force, and soon his separated corps joined hands in front of Fairview.

Stuart pushing forward his command against the Third and Twelfth Corps, the battle became close and sanguinary. Although his attack, as a whole, was general, it was made more or less by subdivisions. To meet such attacks required considerable changing of positions by the divisions and brigades of his opponents; all of which were made in good order, although under a most murderous fire from the enemy. Each division and brigade stood its ground nobly and fought with stubborn firmness. Several times the Federal lines were forced back for a short distance, but advancing, regained the lost ground, the lines of the opposing forces often commingling.

Stuart, in his report, says of this attack: "As soon as the sun lifted the mist that shrouded the field, it was discovered that the ridge over the extreme right was a fine position for concentrating artillery. I immediately ordered thirty pieces to that point, and under the happy effects of the battalion system it was done quickly. The effect of this fire upon the enemy's batteries was superb."

The ridge which he refers to was that of Hazel Grove, just vacated by Sickles. He subsequently established there many more guns. And the battalion system so thankfully mentioned by him, was that so often referred to in these papers, wherein the Confederate batteries were organized into battalions, each commanded by an artillery officer of appropriate rank, who exercised positive, as well as administrative control over it. It was a system of concentration and efficiency, in contradistinction to that of dispersion; and, furthermore, one which relieved division and brigade commanders from the necessity of having their attention diverted from their own appropriate duties to attend to artillery matters, so much better attended to by officers especially appointed for the purpose. The celerity with which Jackson formed his column of attack, in the wilderness, on the flank of the Eleventh Corps, could not have obtained had the infantry commanders been burdened with the care and responsibilities of batteries.

The Third and Twelfth Corps held their ground at Fairview as long as it was possible for troops to do so under such circumstances. The junction of Anderson with Stuart gave the latter great superiority in numbers, and his position enabled him to enfilade one face of the Federal angle while Stuart enfiladed the other. The Third and Twelfth yielded the ground inch by inch and withdrew in good order to the new line behind the "White House."

The battle had now raged for four hours, and the batteries had exhausted their ammunition, and as they could not get a fresh supply they were successively withdrawn. Best conducted his to the United States Ford, there to replenish his chests. A portion of the Third Corps, when forced to retire, joined the right of Hancock's Division nearer the Chancellor house, and there continued the fight until this part of the line also was forced back. Such of the batteries of the Third as still had ammunition took position with the infantry towards the Chancellor house and were exposed to a terrible fire from the enemy, now rapidly closing in upon that position, notwithstanding which, they continued to be most gallantly and effectively served until every round was expended. Their losses in men and horses were unusually severe.

Captain Best, reporting the part taken by his batteries, says: "Early Sunday morning (May 3) the enemy commenced the attack, evidently determined to carry that point, and all my batter-

ies again opened on their masses. * * * My line of guns kept to its work manfully, until about 9 A. M., when, finding our infantry withdrawing, our right and left exposed, and the enemy's musketry already so advanced as to pick off our men and horses, I was compelled to withdraw my guns to save them." He lost heavily in both men and horses.

Lee in his report (following Stuart's account of the battle, but omitting the details) says: "The second and third lines soon advanced to the support of the first, and the whole became hotly engaged. The breastworks at which the attack was suspended the preceding evening were carried by assault under a terrible fire of musketry and artillery. In rear of these breastworks was a barricade, from which the enemy were quickly driven. The troops on the left of the plank road, pushing through the woods, attacked and broke the next line, while those on the right bravely assailed the extensive earthworks, behind which the enemy's artillery was posted (Best's 34 guns). Three times were these works carried, and as often were the brave assailants compelled to abandon them—twice by the retirement of the troops on their left, who fell back after a gallant struggle with superior numbers, and once by a movement of the enemy on their right, caused by the advance of General Anderson. The left, being reinforced, finally succeeded in driving back the enemy, and the artillery, under Lieutenant-Colonels Carter and Jones, (one battalion of batteries each) being thrown forward to occupy favorable positions secured by the advance of the infantry, began to play with great precision and effect."

Simultaneously with the attack of Stuart on the right, Lee attacked the salient position around the Chancellor house, with the divisions of McLaws and Anderson. This position was held by French's and Hancock's divisions of the Second Corps. These two divisions had six batteries, but, as before stated, Couch, commanding this corps, had sent all except nine pieces back to the river as useless impedimenta. In the fury of the fight a battery was borrowed from another corps, making in all fifteen pieces. It was a position demanding all that Couch had and all that could be borrowed besides. These fifteen pieces did noble service, but drawing, as they did, both the artillery and infantry fire of the enemy, now assailing this position in overwhelming numbers, they were very roughly handled.

Lee had retained only about 22 pieces for his operations about

the Chancellor house; but when Stuart got possession of Fairview, and closed in towards Lee, the whole of his artillery, too, was brought in play against it, soon rendering it untenable. The Federal troops were forced back to the new line, which line also had a salient, the apex of which, pointing in the direction of the Chancellor house, was about three-fourths of a mile in its rear.

General Meade, commanding the Fifth Corps, directed Captain Weed, his chief of artillery, to collect all the batteries that he could find and place them in position in this salient. This order was subsequently confirmed by Hooker, and thus armed with proper authority, that energetic officer soon had 56 pieces in position, representing nearly, if not quite, every corps on the field. This salient was a commanding position, looking in the two most exposed directions. On the right face, Weed established 28 guns, and on the other 24, with 4 in the angle. These guns occupied about 500 yards on each side of the angle. During that and the following day the enemy made demonstrations on this position, but no formidable attack. In a professional point of view it is almost to be regretted that he did not do so, in order that the efficiency of the fire of batteries thus massed should have been still further demonstrated.

Weed's services on this occasion were recognized by his promotion to a brigadier-generalcy of volunteers; not, however, to command artillery, for which he had proved himself so well qualified, but to command a brigade of infantry, with which arm he had had no experience whatever. Of the twenty-eight officers of artillery upon whom were conferred the star of a brigadier, only Barry, Hunt, and for a time Brannan, were continued upon artillery duties; all the rest were assigned to infantry commands, and this too when material for such commands was as plentiful as autumn leaves. Most of these artillery officers—Griffin, Terrill, Ayres and others—had won their spurs in command of artillery and nothing else.

Captain Best was not so fortunate as Weed. He commenced his war service as a captain and the close of the war found him still a captain, in which grade he continued until, by regular promotion, he became a major two years thereafter.

The batteries of the Federal artillery were armed and equipped to perfection, and to a fair extent were well instructed also, but here all that was good about the organization ended. The brilliant service of batteries was due to their own excellent quali-

ties, and was in spite of the defects attending the method of using them.

The official reports of the battle of Chancellorsville are laden with complaints that batteries could not have their chests replenished with ammunition. This was a direct result of attaching batteries to divisions, where they had to depend for their supplies upon division supply trains under quartermasters who knew little or nothing of artillery needs, particularly so as regards ammunition. It was not until the batteries of each corps were united into one brigade, with its own ammunition train under its own officers, that this glaring defect was remedied.

While the batteries were crying out for ammunition at Chancellorsville there was an abundance of it with the division trains near by, but the batteries could not obtain it, so defective was the system. There seemed to be a jealous feeling towards the artillery, apparently on the ground that it was desirous of aggrandizing itself by getting control of its own affairs.

While the battle of the forenoon of the 3d was in progress the First Corps arrived, as heretofore stated. Colonel Wainwright, its chief of artillery, arrived with it, and was the first, and in fact the only field officer of artillery on that field. He was at once assigned by Hooker to the task of collecting the batteries and assigning them to proper positions, and to supervising their supply of ammunition. He had scarcely commenced this duty when General Hunt arrived and relieved him of it. While the battle was raging and matters were becoming tangled, Hooker began to appreciate the importance of having a head for the artillery, and, sending for Hunt, reinvested him with that control over the batteries of which he had deprived him at the opening of the campaign.

Such, in brief, were the operations of the artillery at the battle of Chancellorsville, which contest terminated abruptly about 10 A. M. on May 3. This abrupt termination was because of information received by Lee of Sedgwick's operations at Fredericksburg, which were, at first, so successful as to threaten the rear of Lee's army at Chancellorsville and cause him to desist from further attack, and turn to meet the danger now threatening him from that quarter. It will be observed that of Hooker's six corps at Chancellorsville but three of them—the Second, Third and Twelfth—were much engaged. The Eleventh stampeded; the Fifth, guarding the left flank, was not attacked; and the

First did not arrive in time to take part in the battle. Portions of the Fifth were, it is true, engaged and suffered loss, but as a whole the corps was intact.

Lee had, present, engaged, 98 regiments, viz.: Jackson's three divisions, 70 regiments. McLaws Division, omitting Barksdale's Brigade, left at Fredericksburg, 15 regiments. Anderson's Division, omitting Wilcox's Brigade, at Bank's Ford, 13 regiments. Hooker had in the two divisions present of the Second Corps, 31 regiments. In the Third Corps 40 regiments, in the Twelfth Corps 24 regiments. Total 95 regiments.

Beside having more of them, Lee's regiments were, on an average, considerably stronger in numbers than Hooker's.

Their losses were: Hooker, 1082 killed, 6849 wounded, total, 7931. Lee, 1366 killed, 7409 wounded, total, 8775. The former lost 4080 missing, most of whom were captured. Lee did not lose so many prisoners, perhaps not more than half as many.

The operations of Lee in this campaign was a marked instance of an inferior force beating a superior one, by taking it in detail, thereby always having a superior number at the actual point of contact. Jackson was sent around to the extreme right with 70 regiments to attack the Eleventh Corps of 22 regiments. This corps out of the way, Jackson's Corps then attacked and defeated the Third and Twelfth, both together of 64 regiments. In this Jackson's force was materially assisted by Anderson's Division, which gave it still greater superiority in numbers. Lee then concentrated his entire force upon Hancock's Division of 18 regiments, assisted in a measure by French's Division and a portion of the Third Corps; and of these he made short work. By 10 o'clock of the forenoon of the 3d, not a man of Hooker's entire force at Chancellorsville occupied the ground upon which he stood when the battle commenced, excepting only the five batteries under Captain Randol, still holding their position on the extreme left.

The battle of the forenoon of the 3d resulted in the formation of a new and shorter line in rear of the first, still covering the United States Ford. This line was hastily intrenched. Lee, leaving Stuart with his 70 regiments to hold Hooker by frequent attacks and threatening demonstrations, withdrew the divisions of McLaws and Anderson, and turned upon Sedgwick, who, in the meanwhile had stormed the Marye Heights, and broken through the thin line left by Lee to guard his intrench-

ments in rear of Fredericksburg. Sedgwick now had Lee in front of him and a large force under Early in his rear, both closing in to cut him off and crush him. But by consummate generalship and the bravery of his troops he was enabled to withdraw across the river at Bank's Ford. The demonstrations made by Stuart held Hooker from giving any assistance whatever to Sedgwick, who fought the battle of Salem Heights alone, against overwhelming odds.

Lee having driven Sedgwick across the river, was now at liberty to unite his entire force against Hooker at Chancellorsville; but the latter prudently withdrew, crossing the river upon the pontoon bridge, in his rear, during the night of the 5th, and thus ended the Chancellorsville campaign which started out under such fine auspices, but which had such an inglorious ending. The conduct of the Eleventh Corps was eagerly seized upon as an excuse for the failure. This corps being struck, as by a cyclone, in flank and rear, the entire line was doubled up and rolled back upon itself, and there being no line or position in rear upon which the broken troops could rally, they scattered in confusion through the woods, conveying to all an exaggerated impression of panic. Obloquy was heaped upon these troops, unrestrictedly giving this corps a reputation for unsteadiness from which it never recovered, notwithstanding its subsequent good conduct at Gettysburg, and afterwards in the Western Army under Sherman. The fact was that no opportunity was given them, on this occasion, to test their reliability. Struck as they were, unexpectedly, in flank and rear, no troops whatever could have withstood such a blow. It was a case in all essential respects similar to that of Stone's River, where the veteran troops of the Army of the Cumberland gave way, under even less aggravating circumstances. At the time the enemy burst, "with a yell," from the woods upon the exposed flank, those least surprised formed, as well as they could, and opposed a resistance that caused the enemy to consume more than an hour in overrunning the ground occupied by the corps. The enemy reports a sharp resistance at the short and feeble line occupied by Von Gilsa's two regiments on the extreme right; then a still shorter resistance by some of Schurz's regiments which happened to be in rear of the main line, and which had thrown up slight breastworks facing in the direction from which the enemy were approaching, and finally at the line occupied by the spare batteries facing in the same direction. Here, Rodes says, the

second line joined with the first, and both were thrown into "inextricable confusion." This shows that all of the Eleventh did not flee, panic stricken, in the manner generally supposed. These facts were not known at the time to the other portions of the army, and all took up the cry of denunciation against the Eleventh.

There was never any question raised as to the steadiness of the Second, Third and Twelfth Corps in this battle; on the contrary, they were greatly extolled for their superior fighting; yet the records show that, in proportion to the numbers engaged, the loss in killed and wounded of the Eleventh was very much greater than that of the Second; about the same as in the Twelfth, and only a little less than in the Third. These corps were not surprised and taken in flank and rear, as was the Eleventh; but were attacked squarely in front, where they had good opportunity of showing their good soldierly qualities.

Had it not been for the timely and gallant resistance offered by Huntington's twenty-two guns at Hazel Grove, which held the enemy in check until the Twelfth changed position, this corps, too, would have been taken in flank and rear, and would probably have shared the same fate as the Eleventh. This would have cut off the two divisions of the Third, then detached looking after Jackson's column; and would have enabled Lee to have concentrated the whole of his force upon the Fifth Corps and the two divisions of the Second occupying the salient at the Chancellor house, and to have crushed the whole back, in confusion, upon the river. It is difficult to estimate the value of the services of the guns at Hazel Grove.

After this inglorious campaign both armies returned to their former positions—Hooker's to its camps on the Heights at Stafford, and Lee's behind Fredericksburg.

Shortly after the battle, Longstreet rejoined with his absent divisions, and this, together with the new levies brought in by the rigidly enforced draft, brought Lee's force up to nearly 100,000 men.

The next meeting of the Army of the Potomac and of the Army of Northern Virginia was upon the field of Gettysburg, an account of which will be given in the following paper.

INFANTRY FIRE.

BY LIEUT. GEORGE B. DAVIS, 23D U. S. INFANTRY.

INTRODUCTION.

In this paper an appeal for collective fire is made, by showing the inefficacy of individual fire at ranges greater than 400 yards. Collective fire itself is mentioned incidentally.

In Part 1, I have used elementary mathematics at times for the purpose of simplification. The results necessary to establish the limiting range for individual fire are obtained.

In Part 2, I have endeavored to show that our target practice does not accomplish the end it should. And I have made a few suggestions that, I think, would aid in making an improvement in the firing of our army.

Captain Chester, 3d U. S. Artillery, in two articles in the JOURNAL OF THE MILITARY SERVICE INSTITUTE, has shown the danger our method of target practice is leading us into, and he has suggested a method of musketry. His method deserves serious consideration, inasmuch as it would accomplish the end of musketry fire—*i. e.*, a low fire, and directed toward the enemy—if it is practicable.

I have to thank the U. S. Infantry and Cavalry School for whatever in this paper is in the right direction.

IT is well known that, if many shots are fired from a rifle at the same point, there will be formed a pencil* of trajectories, approximately conical in form.

It is evident that if the rifle were subject only to *constant causes* of error the different bullets would strike the same point, because the shots, being fired under exactly the same conditions, would describe the same trajectory. But, owing to the *variable causes* of error, this is never the case, and the bullets describe different trajectories, and hence hit different points on the target.

The Firing Regulations, Part 7, treats of the causes of error, and tables are given showing the average amounts of deflection due to the various causes of error. They are treated at greater length in Mayne's Fire Tactics.

The point of impact of a bullet is the point in which the trajectory of that bullet pierces the target. The surface over which the points of impact are spread, is called the vertical grouping of

* A pencil—a system of lines diverging from a point.

the shots, if the bullets are received on a vertical target; if the shots are received on a horizontal target, or a target sensibly parallel to the line of sight, the surface is called the horizontal grouping of the shots, or the horizontal beaten surface. It has been shown that the shot group is elliptical in form, with the major axis vertical on a vertical target, and in the direction of fire on a horizontal target.

If the positions of the points of impact on a vertical target are known, the positions of the corresponding points of impact on a horizontal target can be easily determined.

If y is the height of a particular point of impact on a vertical target, and x is the horizontal distance from the foot of the target to the point of impact on the horizontal target, and ω

the angle of fall, then $x = \frac{y}{\tan \omega}$

Two assumptions are made in this: 1st, that the trajectory from the vertical target to the "horizontal point of impact" is in a vertical plane; 2d, that the portion of the trajectory joining the two points of impact is a straight line. Both of which assumptions are very near to the truth.

It would seem at first sight that these errors were of an irregular nature, and followed no law, but an examination of the targets shows that the errors are subject to remarkably precise laws, and theoretical considerations verify the fact. These laws are developed in the subject of "least squares." The deviations of the projectile correspond to the errors in physical measurements.

An examination of a target will show that the shots are closer together toward the centre of the group, where a *nucleus* is formed, while toward the edges they are further apart.

The position of the point around which the points of impact are grouped, is found as follows:

Take the lower left-hand corner, when facing the target, as the origin of coördinates: the axis of X , a horizontal line through the origin, the axis of Y a vertical line through the origin. Suppose distances measured to the right of, or above the origin are positive.

Let $x_1, x_2, x_3, \dots, x_n$ represents the abscissae of the n shots; $y_1, y_2, y_3, \dots, y_n$, the ordinates of the n shots; x_0, y_0 the arithmetical means of the horizontal and vertical distances respectively. Then,

$$x_0 = \frac{x_1 + x_2 + x_3 + \dots + x_n}{n} = \frac{\sum x}{n}$$

$$y_0 = \frac{y_1 + y_2 + y_3 + \dots + y_n}{n} = \frac{\sum y}{n}$$

It can be shown that x_0 is the most probable value of the horizontal distances, and y_0 is the most probable value of the vertical distances, and the point (x_0, y_0) is the most probable position of the point that would be hit, if the variable causes of error were removed.

The point (x_0, y_0) is called the centre of impact. To represent this point graphically, at a distance x_0 from the origin draw a vertical line, and at a distance y_0 from the origin draw a horizontal line. The point of intersection of these two lines will be the centre of impact, or point of mean impact as it is also called.

The trajectory which passes through the centre of impact at all ranges, is called the mean trajectory. Represent the horizontal distances of the n shots from the vertical line, drawn through x_0 by $a_1, a_2, a_3, \dots, a_n$; and the vertical distances of the shots from the line drawn through y_0 by $b_1, b_2, b_3, \dots, b_n$. Then

$$a_1 = x_1 - x_0 \quad a_2 = x_2 - x_0 \quad a_3 = x_3 - x_0 \quad \dots \quad a_n = x_n - x_0$$

$$\text{Adding, } \sum a = \sum x - n x_0 \therefore \frac{\sum a}{n} = \frac{\sum x}{n} - x_0, \text{ or } \frac{\sum a}{n} = x_0 - x_0 = 0$$

$$\text{Similarly, } \frac{\sum b}{n} = 0$$

That is, the algebraic sum of the horizontal (or vertical) deviations with respect to the centre of impact is zero. And in a *great number* of shots the distribution with reference to horizontal and vertical lines through the centre of impact will assume a great degree of regularity. And it follows that the number of hits in each of the four quadrants will be nearly the same.

If we regard all the deviations with respect to the centre of impact as positive, then $\frac{\sum a}{n}$ and $\frac{\sum b}{n}$ will represent the mean horizontal and mean vertical deviations respectively. The smaller $\frac{\sum a}{n}$ and $\frac{\sum b}{n}$ are, the greater is the probability that an error of given magnitude will not be made, hence the greater the probability that a target of given size will be hit. (It is supposed that the range is accurately known.) Now the smaller $\frac{\sum a}{n}$ and $\frac{\sum b}{n}$ are, the

smaller is the shot group; and the closer a rifle puts all its shots to the centre of impact the more accurate is the rifle. Hence, "Accuracy of a rifle may be defined as the greater or less probability of hitting a target of given dimensions." Rifles could be graded according to accuracy by computing a table showing the probability that each rifle has of hitting a target of given dimensions at the different ranges.

The greater the accuracy the greater is the value of a rifle, or in other words, the greater the degree of concentration of the shots the greater is the value of the rifle.

The absolute deviation of a shot with reference to the point aimed at is the distance of the point of impact of that shot from the point aimed at.

The mean absolute deviation with reference to the point aimed at is the distance of the centre of impact from the point aimed at. This depends on the skill of the firer. For example, if a rifle groups its shots too low, or too high, a suitable change in the elevation will make the centre of impact and the point aimed at coincide. Similarly, if the group is to the right or left, a change in the amount of wind gauge will correct the position of the group. Hence the centre of impact and the point aimed at may, for convenience, be considered to coincide.

The mean absolute deviation would measure the correctness of the fire.

The dimensions of the shot group for the different ranges are deduced from the fire of a great number of bullets, and it is supposed that the good shot can approximate to the dimensions thus deduced.

Suppose there is a target the size of the shot group for that range; it is useless to increase the width beyond this limit without increasing the height of the target, because it can be shown that the probability that the vertical deviation of an additional shot will exceed a given amount, S , is greater than the probability that the horizontal deviation of an additional shot will exceed the same amount, S . Hence, the shot is more likely to go over or under than to the right or left of the object. The shot group is supposed to be well placed.

If the object is of smaller dimensions than the shot group for that range, many of the shots will not hit the object, no matter how skilful the firer may be. If the object is of greater dimensions than the shot group all the shots will hit the object, except abnor-

mal shots. In this case a poor firer has a chance of making more hits than if the object were of less dimensions than the shot group, or of the same dimensions.

This shows the necessity of comparing the dimensions of the shot groups with those of the usual objects which are seen in the field.

On page 59, Mayne's Fire Tactics, the usual dimensions accepted in Europe, are given.

The height of a standing man is given at 5.50 feet. In this country the height of a standing man is taken at 5.75 feet. As a bullet which would hit a man 5.50 feet in height would hit a man of 5.75 feet, the former height is assumed in this paper. Moreover the former height is more unfavorable to the rifle than the latter.

If the highest point of the trajectory of the extreme range of the rifle were not over 5.50 feet above the line of sight, there would be no necessity of altering the sights from the moment the enemy came within firing distance. But there is no rifle with such a flat trajectory. It would be advantageous to know the extreme range that the bullet would remain under the height of a man, or in other words, to know the trajectory whose maximum ordinate is 5.50 feet. A calculation will show that, for the Springfield rifle, this range is 410.4 yards. But this calculation is for the mean trajectory, and if the elevation for this range were used, the bullets of the upper half of the pencil would be over the height of a man at certain distances. If the elevation for 400 yards is used, no bullet would pass over 5.50 feet above the line of sight. This can be seen from table 3.

At 210.4 yards the vertical deviation is 0.24 feet, hence the maximum ordinate above the line of sight of the upper trajectory of the pencil is 5.42 feet.

If aim is taken at the feet there is a continuous danger zone against a standing man from the muzzle to 400 yards.

If aim is taken at the centre of the object with the elevation for 400 yards, the dangerous zone is 114 yards, 65 yards in front and 49 yards in rear of the object. The maximum continuous danger zone with this point of aim corresponds to a range of 347 yards, and the dangerous zone continues beyond the object for a distance of 53 yards. The firer is supposed to be lying down as he would be generally. If he is standing and if aim is taken at the centre, the maximum continuous danger zone corresponds to a

range of 255 yards, and the danger zone at this range extends beyonds the object for 60 yards. (Springfield Rifle and Carbine.)

All experience has taught that men will not alter their sights in battle, especially at the shorter ranges, hence the greater the range is for the final adjustment of sights the better. Experience has also taught that the men in battle usually fire high. It would be well to teach men in peace to keep their fire low. To accomplish this end the men should be taught to aim at the foot of the target.

In foreign armies the normal point of aim is the foot of the object, and this point has been chosen for the following reasons. (See Mayne's *Fire Tactics*, p. 67.)

1st. Aiming at the bottom of an object, the line of sight inclines more and more towards the ground as the enemy gets nearer.

2d. Aiming at the foot of the object gives a more advantageous position to the shot groups, and makes the zones grazed by the pencil of trajectories longer.

3d. The ricochets from all the lower half of the pencil are effective.

4th. When aim is taken at the centre of an object, if a shot be fired with a little too much elevation, or if more fore-sight than usual is used, the bullet may pass above the head of a standing man. This inconvenience is not so much felt when aim is taken at the foot of the object.

5th. The fore-sight is not so likely to hide the objective from view.

6th. Tactically it is more advantageous to aim at the foot of an object than at the centre.

The reasons for this are that if the enemy's line is covered by smoke the only point to aim at is the line of separation between the ground and the bank of smoke. If smokeless powder is used the line may be seen, but there is no definite line marking the centre, and a little higher than this central line would cause the bullets to fly over the heads of the enemy. It is better to teach the men to fire low, because the tendency in battle is to fire high.

Referring to Table 1, it is seen that against a kneeling man, 3.67 feet high, the zone grazed by the whole pencil of trajectories extends from about 320 yards (more nearly 322 yards) to 400 yards. Against a kneeling man there would be a "dead space"

when the 400 yards elevation was used. If for ranges under 320 yards the elevation for this range were used, this "dead space" would be completely covered. With the sight at present in use, it would be impossible to make the men alter their sights for ranges under 400 yards. It is doubtful if men in the heat of action could be made to adjust one sight for 400 yards, or for any other range.

The sight is not fine enough for matches, and its adjustment is too difficult to be used in battle.

The rifle should have three sights, namely ;—a fixed sight for ranges under 320 yards, a flap sight for ranges between 320 yards and 400 yards, and a leaf sight for the longer ranges. Tables 1 and 2 show that with these sights the ground would be completely covered.

The next question to consider is the objective against which an individual fire may be expected to be effective. It must be remembered that, in this fire, a man is supposed to hit the object aimed at. In battle, when firing against a mass of the enemy, *some one* may be hit, although it may not be the one aimed at. Individual fire is the fire of men freed from all control. That is, they regulate their own consumption of ammunition, and are free to choose their own objectives, and to arrange their sights. (Fire Tactics, Mayne, p. 79.)

In deciding on the objectives, it must be remembered that the size of the object must be such that there will not be an undue consumption of ammunition to accomplish the result. And that this may be the case, it is necessary that the size of the object corresponds with the accuracy of the rifle, flatness of the trajectory, skilfulness of the men firing, and the errors in judging the distance.

If the range is exactly known, Table 2 will show if the accuracy will admit of firing at an objective situated at that range.

If the range is not known exactly, the four points mentioned will have to be considered. If the accuracy of the rifle and skilfulness of the men firing admit of firing at an object, yet the error in estimating the distance must be less than the dangerous zone of the rifle for that range, for if this is not the case the bullets may all fall short, or pass over the top of the object.

It is supposed that a distance can be estimated to within $\frac{1}{8}$ of the distance, but an over-estimate is as likely to be made as an under-estimate, hence the total error may be $\frac{1}{4}$ of the distance.

If the object is at a distance of 500 yards, an error of 125 yards may be made, but the dangerous zone is only 81.5 yds. against a standing man. To make the fire reliable at this distance the range must be known to within 1-12.

If the object is at a distance of 400 yards an error of 100 yards may be made, but it has been shown that with the elevation for this range there is a continuous danger zone from the muzzle to a distance of 400 yards. This is the greatest range for which the conditions mentioned are fulfilled when the range is unknown.

When the range is exactly known, fair results can be obtained up to 800 yards.

The Germans think that individual fire for ranges greater than these is a waste of ammunition.

The French consider that an individual fire up to 400 m. will be effective against an object the height of a standing man.*

PART II.

"We train men in peace for what we wish them to do in war. When war comes we must be satisfied if they do what we have taught them. If the instruction is faulty, the country whose armies have been badly trained suffers. When war is declared, the time of preparation, the time for training is past, the day of action has come. If the weapon is not well tempered, wants edge, and is useless, the responsibility rests with those who have allowed it to become so." (*"A Précis of Modern Tactics,"* by Colonel R. Home, British Army, p. 124.)

If we are training men for what we wish them to do in war, it is

* NOTE: The new rifle is to have an initial velocity of about 1950 ft. The weight of the projectile is to be 230 grs. The diameter of the projectile is to be .30 inches. Assuming these numbers to be correct, the following table was deduced for the 500 range:

DIS. Ordinates of the trajectory above the line of sight.	
Yds.	Ft.
0	0
100	2.41 Maximum ordinate 4.43 feet, at a distance
200	4.08 of 274.24 yards.
300	4.40 The danger zone for the range 542.5 is
400	3.19 542.5 yards. This range has the maxi-
500	0 mum continuous danger zone.

It is to be hoped that the sights will be so arranged that there will be a flap sight to correspond with the range that has the maximum continuous danger zone; a fixed sight for use against kneeling men under this range; and a leaf sight for the long ranges.

necessary to have the training carried on under war conditions as nearly as possible. If this is done, we can form an idea of what to expect in war. Without these conditions the records are worthless. It is mere firing "for record." It will be shown that we have no practice except for the purpose of record.

We have failed, in our Firing Regulations, to distinguish between firing in battle, and firing in a match.

The preparatory drills are all that could be desired. It would be a great advantage to use only one sight, and for the following reasons the full sight seems to be the best. A soldier firing quickly is more likely to use a full sight than a fine sight. When he is excited a full sight is easier to use than a fine sight, he is more likely to take the same amount of front sight if he *always* uses a full sight, and the taking of a different amount of front sight is a prolific source of inaccurate shooting. A full sight does not strain the eye to the same extent that a fine sight does. A full sight can be used in all lights and at all ranges.

All soldiers are required to fire over the known ranges of 200, 300, 500 and 600 yards. If the required total score has been made, the soldier fires at 800 yards.

A company fires an average of 335 shots a man, including the collective fire. On the same basis each man fires 169 shots over known ranges, or, roughly, one-half of all the shots. (See pars. 872, 873, Firing Regulations.)

The individual and file firing are over known ranges. In skirmish and volley firing the ranges are estimated.

Individual firing is at the rectangular vertical targets. The other kinds of fire are at silhouette targets.

In regard to the point of aim the Firing Regulations say: "It is especially advantageous to aim at the lower edge of the bull's-eye endeavoring to cover no portion of it; if this plan is not followed it is difficult to determine just how much of the bull's-eye is covered, and at the moment of discharge it is even possible for the rifle to be directed above the bull's-eye, without the soldier being aware of his error. This method of aiming also *possesses the advantage of tending to impress upon the soldier the necessity for directing his fire just below the object he desires to hit, and thus, in action, adding to the chances for a direct hit, those offered by the ricochet.*" (Par. 825. The words italicized are not italicized in the text.)

"At the short and mid ranges a half sight should generally be

taken ; at the longer ranges especially if the light is bad, it may be better to take a full sight." (From par. 284.)

" * * * aim carefully and steadily at the lower edge of the bull's-eye, or rather at the line of white just under that division." (From par. 284.)

Referring to the importance of the soldier's individual target record, the Firing Regulations, par. 318, say : " This is especially important at the longer ranges, where the secret of success lies mainly in the ability to determine the proper amount for holding on or off, above or below the bull's-eye, or even the target. * * * "

The first quotation acknowledges the importance of aiming low, but the idea is not carried out, inasmuch as the bull's-eye is placed in the centre of the target, and a hit below the bull's-eye is a direct hit. The soldier is taught to aim at the centre of the object before him, *i. e.*, the target ; in battle he will try to aim at the centre of a man, and the result will be that the bullet will fly high.

The effectiveness of ricochets may be judged from the following extract : " The Siege Operations Committee found that on the targets fired at, one-fifth of the hits were ricochets." (Fire Tactics, Mayne, p. 15.)

In the second quotation different sights are recommended for different ranges. This is all very well for matches, but for battle it will not do. If we teach men to use several sights, can we expect that, in the excitement of battle, they will remember which one to use ? The men should be taught to use *one* sight at all ranges. For the reasons given on p. 314 the full sight should be used.

In the third quotation we are taught to have a line of white between the lower edge of the bull's-eye and the point aimed at. It is impossible to follow this direction in battle. A system which teaches it is radically wrong.

In the fourth quotation the secret of success in long range individual fire is given. Such being the secret of success, long range individual fire is, generally, a waste of ammunition. It must be remembered that the result of each shot is signalled to the firer. If this were not the case, often not a single shot would hit the target.

If all these refinements are required for success, why do we expend so much ammunition in long range individual fire ? It is to

obtain a record for long range individual fire. Such a record is worthless, because the fire could not be carried on in war with effect against the objectives now seen, nor is it desirable to try to have such a fire in battle. In Part I, it was shown that the ballistic qualities of the rifle, and the errors of the individual man, do not admit, ordinarily, of long range individual fire.

In regard to the weather in which target practice should be carried on, the following quotations from the Firing Regulations, will show the theory followed in our army:

"While it is desirable that the soldier should be instructed in firing under varying conditions of weather, yet practice, particularly in the first weeks of the target season, should not be held on days when the conditions are so unfavorable as to prevent accurate shooting." (Par. 181.)

"Such an hour of the day will generally be selected for the regular practice as, considering the direction of the range with reference to the sun, the prevailing wind, etc., seems most favorable. An hour, however, will be chosen when the men are not fatigued from the performance of labor or from drill, and when sufficient time can be obtained for the deliberate completion of the firing before they are required for other duty. If this is not practicable the practice will be continued at some other time and until all the men have fired." (Par. 182.)

" * * * In this case his firing can be held at any range, and the particular conditions of weather, which on the day assigned for practice may be more favorable for firing at the short than at the longer distances, or the reverse, can then be taken advantage of and more satisfactory results thereby obtained." (Par. 220.)

These quotations show exactly what our target practice is for, *i. e.*, to obtain a fine record, and to delude ourselves with the idea that our army is in condition for battle. Not a word is said about firing under battle conditions. It is all to obtain more satisfactory results. If the enemy would wait for favorable weather, it would be proper to teach soldiers to fire only in favorable weather. Unfortunately the enemy will not wait, and the army must suffer from the lack of knowledge that should have been obtained in peace. The favorable and the unfavorable weather should be taken together.

The option is given to company commanders to have practice on unfavorable days. No company commander will do so, as long

as the *record* is the paramount consideration and the company's efficiency is judged by the record so made.

It is not the individual man's fire record, but the fitness of the company for war that should be desired.

The era of an army of marksmen has passed; the era of mutual support and coöperation is with us.

An army may have to fight at the end of a long march. In such a case the men are fatigued. And yet it is forbidden to hold target practice when the men are fatigued.

In regard to the range itself, the Firing Regulations say: "Smooth, level ground, or ground with only a very moderate slope, is best adapted for a range. If possible, the targets should be on the same level with the firer, or only slightly above him. Firing down-hill should, if practicable, be avoided." (Par. 455.)

To render the conditions of firing more artificial, it is customary to have the men fire from platforms on a level with the targets, if the latter happen to be above the level of the firer.

Smooth, level ground is seldom, or never, found for a battle.

It seems that firing down-hill should not be practically forbidden, inasmuch as the most favorable position for defense is on ground sloping slightly to the front. We find in the histories of battles that such ground is always selected if it can be found. "A good position should command a view of the movements of an assailant, and should not be itself commanded by any higher ground within artillery range." (A Text Book of Military Topography, p. 93.) "The most favorable ground for defense is one which presents, in front of the firers, a clear glacis, forming a free field of fire of great extent, and inclining gently in the direction of the enemy." (Fire Tactics, Mayne, p. 227.)

The targets for individual fire are rectangular with an elliptical bull's-eye in the centre of the target. Values are assigned to the shots according to the position of the point of impact on the target. These values range from 0 for a miss, to 5 for a bull's-eye. This classification of the shots is for the purpose of record, because in war a hit is a hit no matter what part of the object is hit.

The outer limit of the 4. ellipse, on the 200 yards target, is 30 inches high and 24 inches wide. The total width of a man is 21 inches. (See Fire Tactics, Mayne, p. 58.)

If in the individual practice a soldier attains a total score of 640, his regular practice is extended to 800 yards. In other words the soldier will shoot for the grade of sharpshooter. As

the soldier fires 40 shots at each of the ranges 200, 300, 500 and 600 yards to attain this total score, he must have an average of 4. Hence it is possible for a man to shoot for the grade of sharpshooter without having put a shot, in individual practice, within the width of a man.

It would seem that no shot should count as a hit unless it would hit a man when aim was taken at him, *i. e.*, when he is standing in front of the bull's-eye every hit should be within the outlines of his figure.

The object is not necessarily to kill; many consider it better to wound a man, because it may take some combatants to carry him off the field.

A silhouette is a better target than the rectangular targets, because any shot that would hit such a target would hit a man, and the silhouette resembles what the soldiers would see in battle, if they saw anything beyond a cloud of smoke.

If the soldiers are classified, let it be according to the size of the shot groups they make. It was shown in Part I that such a classification would be possible.

It has been seen that one-half the total number of shots fired is fired in individual fire. All authorities are agreed that a controlled collective fire should be used as long as possible. It is thought that this fire can be kept up to within a distance of 400 yards from the enemy.

In foreign armies every effort is made to obtain this controlled fire. In our army, on the contrary, no effort is made to obtain a controlled fire, but our efforts are directed toward an individual fire, and an independent fire at that. A controlled fire must be used if the ammunition is to hold out. Furthermore, a controlled collective fire has the greatest moral effect on the enemy.

Some reasons were given in Part I for limiting the individual fire to ranges under 400 yards; what has just been said gives additional reasons for so limiting it.

It would be well to limit the number of shots fired in individual fire to 50 for each man. This leaves 285 shots to be expended in controlled collective fire.

There should be no firing over measured distances. The distances should be estimated or determined by means of range-finders. The shots should not be signalled to the firer, because if they are, the firer depends upon the signal rather than upon his judgment.

In controlled collective firing the officers give the elevation to be used, the amount of wind gauge, and the objective to the firers. With this exception, the soldiers in battle will have to judge these elements for themselves; in peace they should be trained to do what they are expected to do in war.

Before continuing the subject the results arrived at in the preceding part of the paper will be summarized.

Silhouette targets should be used. In individual fire each man should be assigned a target. For ranges from 0 to 200 yards the target should represent a lying down man; from 200 to 300 yards the target should represent a kneeling man; from 300 to 400 yards the target should represent a standing man.

As a rule individual fire should be limited to ranges under 400 yards. It might be well to train picked men at greater ranges for the purpose of picking off the enemy's officers, orderlies, etc.

A ricochet should count as a hit.

A full sight should be used.

Aim should be taken low.

Practice should be held in all kinds of weather and at all hours of the day.

A number of shots with the present allowance of ammunition, should be limited to 50 a man.

With the expenditure of the 50 shots, a man's instruction on the range in individual fire should end.

The remainder of a man's instruction in musketry should be carried out in the autumn manœuvres. To explain the way in which this should be done a digression must be made.

The commanding officer could have targets set up at unknown points of the line of march. As soon as the cavalry came upon these targets word should be sent back. The troops would hurry forward. The reconnoissance would be made. The artillery, and bodies of infantry detailed for the work of preparation, would prepare the line for the assault. The assaulting troops would be sent forward in small columns until the enemy's fire became too severe, when a line formation would be assumed; this would be kept up until the fire became too severe for this formation, when a line of groups would be formed. This line of groups would be reinforced by groups. The groups should always be pushed into the intervals. Finally, when the fire again became too severe the groups would be deployed into a line of skirmishes. At this.

time reinforcements would, generally, be pushed forward with the utmost rapidity.

Until the groups are deployed a controlled collective fire should be used. When the groups are deployed, it will generally be impossible to keep up a controlled fire, and an independent fire must necessarily be allowed. The fire should always be carried on by as large bodies of troops as possible.

In order that such a fire may be used in war, peace training is necessary. The strictest fire discipline must be obtained.

The subject of fire tactics has been neglected, strategy is a more pleasing study. But it must not be forgotten that the few use strategy, the many use tactics. Every officer should have a thorough knowledge of tactics. Fire tactics is a subject of paramount importance. It has grown to such huge dimensions that special study and instruction are necessary. In order that every officer may acquire this special knowledge a school of musketry should be established.

APPENDIX.

TABLE 1.

Ordinates of the trajectory above the line of sight.

Elevation for	100 yds.	150 yds.	200 yds.	250 yds.	300 yds.	350 yds.	400 yds.	Maximum Ordnate.
yds.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
300	2.3	2.6	2.4	1.5	0			2.67
400	3.7	4.6	5.1	4.9	4.1	4.0	0	5.18

TABLE 2. (From Springfield Rifle and Carbine.)

ACCURACY.

Range. yds.	Radius of circle shots, inches.	Range. yds.	Radius of circle shots, inches.
100	1.3	500	7.6
200	2.7	600	9.5
300	4.2	700	11.6
400	5.8	800	13.8

TABLE 3.

Height of the upper trajectory of the pencil above the line of sight when the 400 yards elevation is used.

Distance. yds.	Aim at the foot of the object. ft.	Aim at the centre of the object. ft.
100	3.8	6.55
200	5.3	8.05
300	4.5	7.25
400	4.8	3.23

SHRAPNEL FIRE.

BY LIEUTENANT A. D. SCHENCK, 2D U. S. ARTILLERY.

SHRAPNEL fire has become one of preponderating importance with modern field artillery. After the advent of the rifle gun, defective fuses for a time caused the belief in the superiority of the cannon shell; and to improve its effects when burst on graze, various forms were devised to increase the number, and uniformity in size, of the fragments. But this kind of fire, to insure both extended range and effectiveness, necessitates a flat trajectory, to prevent the projectile from burying in the ground or from throwing the fragments up into the air at too great an angle. In trying to secure the greatly extended ranges now deemed indispensable by increasing the velocity, the limit of endurance of the carriage was soon reached, and the recoil became excessive, and still the range was not attained with a trajectory flat enough to insure effective fire when this shell burst on graze. At even moderate battle ranges the shell buries itself in the ground; at shorter ones, when this does not take place, the fragments are thrown up into the air at too great an angle, and the slightest cover for the enemy renders such fire wholly ineffective.

Modern improvements in time fuses have made it possible to burst shrapnel quite as accurately as to burst the shell on graze, while the direction taken by the bullets tends directly toward efficiency, especially in the efforts to search out the enemy under cover. But at first it was thought, in some quarters, to apply this kind of fire with the velocities which had been desired, and in some cases to a large extent secured, for the shell. Practical experience soon demonstrated that, first, the greatest possible approximation to *uniformity* in the velocity was necessary, and when this had been secured, by the use of projectiles of great sectional density; second, that these high velocities must be considerably reduced in order to secure a proper angle of fall to render the shrapnel effective.

It is recognized of course that accuracy of fire as to direction, etc., is requisite first of all, and that flatness of trajectory aids in

this. But it is apparent that increased sectional density for the projectile will give an equally flat trajectory with "apparently" a much lower velocity, while its greater weight and living force insures much greater accuracy with actually a considerable reduction in the initial velocity and muzzle energy, and in the recoil and strain on the carriage. With such projectiles and a very moderate initial velocity, accuracy of fire is insured so far as respects the modern gun. It invariably shoots where pointed, and with variations in absolute deviation astonishingly small even at very great ranges, and we are at liberty to choose any reasonable velocity for a field gun which will insure proper angles of fall for our shrapnel and also favor the security of the carriage and restrict the excessive recoil, being assured beyond a doubt that if accuracy is not secured, it is not the fault of the gun but of the gunner.

In order to compare directly shot, shell, and shrapnel, of varying material and density, it is necessary to reduce all to a uniform density, say that of cast-iron at 7.2. This being done, with proper allowances for the true diameters, the following table gives the comparative lengths of representative modern projectiles which experience, as well as ballistic science, demonstrates to be necessary to insure good results; together with the absolute projectiles used in our own guns, and which in the nature of things cannot be made to give good results.

MODERN PROJECTILES (CAST-IRON, SP. GR. 7.2).

	Calibre. inches.	Proj. lbs.	Length in calibres.
Steyer Carbine.....	0.315	(246 gr.)	5.924
Hotchkiss.....	2.24	6.00	3.314
Russian (mountain).....	2.50	9.16	3.569
Canet.....	2.95	13.67	3.275
U. S.....	3.20	13.50	2.565
English.....	3.40	22.00	3.404
U. S.....	3.60	20.00	2.644
Hotchkiss.....	3.94	33.00	3.320
Krupp.....	4.134	35.90	3.154
Canet.....	4.724	55.11	3.218
Krupp.....	15.75	2314.00	3.526

From this it appears that for the carbine, where both the limitations and requirements are greatest, when a high velocity, flat trajectory and great range constitute the *sine qua non*, the length

of projectile is greatest, the actual length being nearly 4 calibres. For artillery the limitations are greatest for the mountain gun, even to one for a low velocity; yet to render the fire, especially with shrapnel, effective, the length and sectional density of the projectile must of necessity be high. At the other extreme stand the heavy sea-coast guns, where the high velocity and flat trajectory with a solid projectile are as imperative as for the carbine, and Krupp's standard projectiles for such guns are 3.5 calibres long.

For field artillery the weight of projectile is of course determined by that of the ammunition which can be carried by a battery, divided by the number of rounds which experience demonstrated should be carried, about 20% being for the charge. It is quite evident that the weight of the projectile must be the greatest possible, for upon this and the number of bullets it contains or fragments it gives, depends directly the volume of the artilleryman's fire. For, whether his projectile weighs 13, or 18 pounds, when accuracy is assured the *rate* of his fire remains the same, but evidently not so its value and destructive power. On the other hand the infantryman with a solid bullet can only increase the volume of his fire by increasing the rate, and hence first the breech-loader, and next, to meet the increased demand for ammunition incident to its use, the production of the modern small calibre rifle, the flat trajectory of the lighter bullet being secured by greatly increased sectional density and a higher velocity which the reduced calibre permits without increased recoil.

Since the advent of the exceedingly strong shrapnel shell constructed from a thin steel solid-drawn tube, there is no valid reason why a shrapnel, the equivalent of a solid cast-iron projectile 3.5 or even more calibres length, should not be used, at least similar in length to that for the mountain gun where the limitations are greatest for field artillery. But for the present discussion and to avoid extremes, suppose this length be limited to say 3.3 calibres, the projectile for a horse artillery gun being taken at 13 pounds, which is slightly heavier than for those generally in common use, and capable of being carried in our service in number equal to that for foreign services, without increased load behind our teams. In field artillery, it should be first stated that "the gun is made to suit the projectile, not the latter the gun." Under the above conditions we should have as the proper weight of projectiles for our guns already existing, and the calibres for the horse artillery gun yet to be constructed:

Kind.	Calibre. inches.	Projectile. lbs.	Length, in calibres.
Horse Artillery Gun.....	2.90	13.	3.30
Light Field Gun.....	3.20	17.83	"
Heavy Field Gun.....	3.60	25.42	"

It is at once seen that the weight of these projectiles corresponds very nearly with the best examples of similar ones in Europe, while the sectional density will generally be at least equal if not superior. The weights for our new limbers, caissons, etc., show that under proper conditions we can not only carry the number of rounds usual in foreign batteries, but do so and retain the same loads behind our teams which have heretofore obtained in our service, and which have been approved as correct by wide war experience. Good sectional density having been secured, good ballistic results will be assured under the most favorable conditions.

It being generally conceded that shrapnel fire is of controlling importance for field artillery, it is next in order to determine what velocities and other conditions are necessary to render it most efficient in battle. These will first depend to a large extent upon the size of the shrapnel bullet, those in practical use being generally from 27 to 40 to the pound. Of course the smaller the bullet the better, in the sense that we thereby increase the number and consequently the chances of hitting. But on the other hand the small bullet limits somewhat the danger-space in the direction of fire and requires a higher velocity (the final velocity of the shrapnel shell at burst) to render it effective. Bullets 34 to the pound are within the limit of present practice and have been used with good results by the English Royal Artillery. The steel shrapnel shell ought to contain at least 45 % of its computed weight in bullets, and a 17.83 pounds projectile for the 3.20-in. gun (which is taken for illustration) should contain 272 bullets, 34 to the pound. (The new German 17.97 pounds shrapnel is said to contain 270 bullets, size unknown.)

The area presented by the average man standing in ranks is 8.25 square feet, and the cone of dispersion should be so regulated as to cover at the target a circle or "pattern" whose plane is perpendicular to the line of the trajectory, and whose area is

2244 square feet with a diameter of 53.5 feet, or 30 files of infantry in ranks, the length of the possible danger space from the point of burst in the direction of fire varying from 342 yards at 1000 yards range, to 240 at 5500 yards range, but at the longer ranges the angle of fall projects the bullets to the ground within the limits in this direction.

Colonel Benton states that "from experiments made in Denmark, the following relations are found, between the penetration of a bullet in pine and its effects on the body of a living horse, viz.:

"1st. When the force of the bullet is sufficient to penetrate 0.31 inch into pine, it is only sufficient to produce a slight contusion of the skin.

"2d. When the force of penetration is equal to 0.63 inch, the wound begins to be dangerous, but does not always disable.

"When the force of penetration is equal to 1.2 inch, the wound is very dangerous."

In the Ordnance Manual it is stated that the old musket ball, with a velocity of 362 f. s. at impact, was just equal to the penetration of a 1-inch pine board, and had sufficient force to shatter the leg-bone of an ox covered with one thickness of stout harness leather.

The measure of the efficiency of a shrapnel bullet has been taken as the ability to penetrate 1.2 inch of pine at 100 yards, and the limitation may be taken as the penetration of 0.63 inch at the same distance, consequently all bullets should reach the ground with the latter force. To enable a bullet of 34 to the pound to penetrate 1.2 inch of pine at 100 yards, requires an initial velocity of 646 f. s. which, therefore, must be the final velocity of the shrapnel shell at burst at the maximum range desirable, or practicable. Prince von Hohenlohe has stated that in the future, artillery will at times fire at a range as great as 5500 yards, and that the modern gun at this range is as accurate as the old smooth-bore was at 1200 yards. As is well known from actual firing, it will be no fault of the gun if artillery shrapnel fire is not accurate and effective at this, or even greater ranges.

Good telescopic sights assured, the fire will be exceedingly effective at such range when the nature of the ground will permit of its use. Without such sight, effective fire at even a much reduced range is beyond the limit of human possibility.

The range and power of the gun already far surpasses the limits of human vision, and it is incumbent on the gun-maker to waste no more time on the gun, but to perfect a sight which will enable the gunner to utilize to even a reasonable extent the power already developed. Of what use placing the bow of Ulysses in hands incapable of bending it? Of what use the range of the modern field-gun when the unaided human eye can see nothing of an enemy in the field at less than half the distance? But we can hope for the advent of the telescopic sight. To enable the 3.20-in. gun with a 17.83 pounds projectile to attain a range of 5500 yards with the 646 f. s. for the shrapnel bullet, requires an initial velocity of 1399 f. s. and 243 f. t. muzzle energy. Apparently this does not compare favorably—except in the treatment of the carriage and recoil for the artilleryman—with the present 1668 f. s. and 262 f. t. with a 13.5 pounds projectile. But at the end of the above mentioned range, under the new condition this same gun will give 646 f. s. and 52 f. t. of energy, with a less charge of powder than is at present required to give 631 f. s. and 41 f. t. at the same range. At the longer ranges the trajectory of the heavy projectile will be the flatter, and, as will presently be seen, at the shorter and ordinary battle ranges it will be entirely too flat, while its sectional density and living force will give it greater accuracy at any range.

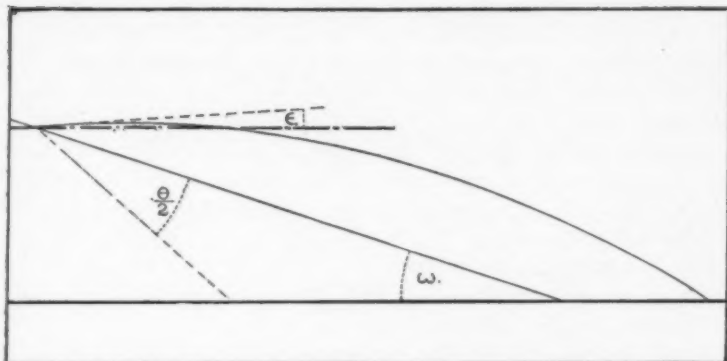
It is evident that the angle of fall of the shrapnel shell should be such as to cause all of the bullets to reach the ground before losing their effective velocities supposing a proper burst, viz.: all bullets must reach the ground with a penetration equal to or greater than 0.63-inch into pine. Neglecting the height of burst, the angle of projection of the bullet at the highest element of the cone of dispersion, to attain the ranges at which the penetration will equal 0.63-inch, will be from about $1^{\circ} 40'$ to $1^{\circ} 50'$. Thus this angle of projection for the bullet under consideration, will be approximately a constant, due to the fact that its initial velocity varies inversely with the range of the gun, the "range" of this bullet also varying in the same manner. Therefore we have as the limiting angle of fall for the shrapnel shell to insure the effi-

ciency of all the bullets it contains; $\tilde{\omega} = \frac{\theta}{2} - \epsilon$, in which:

$\tilde{\omega}$ = Angle of fall.

θ = Angle of the cone of dispersion.

ε = The approximately constant angle of projection of bullet as above, in this case = $1^{\circ} 45'$, about.



At all of the extended ranges the angle of fall is greater than $\theta = 1^{\circ} 45'$ for this gun under the conditions supposed, and all of the bullets will be effective. Supposing the true diameter of the steel shrapnel shell to be 3.17-in., and its thickness 0.3-in.—the angle of rifling of the gun being $6^{\circ} 29'$ —then at 2200 yards the angle of the cone of dispersion will be $14^{\circ} 28'$, and the angle of fall $5^{\circ} 28'$, and $\frac{14^{\circ} 28'}{2} - 1^{\circ} 45' = 5^{\circ} 29'$. Consequently at about

2200 yards the trajectory has reached the limit of flatness, and as the range now becomes shorter, an increasing number of bullets at the top of the cone of dispersion fly up into the air only to come harmlessly to the ground, and the shorter the range the less the efficiency of fire. In other words, at the time when the infantry is getting well into the first stage of the battle and can begin to utilize the fire of its modern rifle, and is becoming more and more efficient as it advances, the artilleryman's efficiency of fire begins to fall off, the defect increasing as his enemy advances and his fire is becoming more and more effective. The enemy can soon depend for aid upon ricochets, which will be certain in deadly effect from the energy of the rifle ball; but the moment a shrapnel bullet strikes the ground, even under the most favorable circumstances, it will practically always become ineffective. While the rifle ball may go through from one to half a dozen men, the shrapnel bullet will never go through one man. Moreover, the

moment the infantry takes to cover however slight, it is secure from shrapnel fire when the trajectory is flat.

Actual practice and experience upon the range with shrapnel fire has everywhere demonstrated the correctness of this theory, and to remedy the defect resort is had to high-angle fire with reduced charges. With this, as with direct fire, it is obvious that the shrapnel must come to the ground with a velocity sufficient to render its bullets effective. However desirable it may be to secure a great angle of fall in order to search out an enemy behind cover, the angle of projection can never exceed that which permits a sufficient final velocity. For the gun and conditions here assumed, with the full charge the fire will be effective until the range is reduced to about 2200 yards. This, then, presents a new point of departure as the extreme range for high-angle fire with a reduced charge. As for the extreme range, the final velocity at 2200 yards cannot be less than 646 f. s., the charge and density of loading being reduced sufficiently to give an initial velocity of 795 f. s. with which the angle of projection for this range will be $11^{\circ} 28'$, the angle of fall $13^{\circ} 6'$, and the shrapnel again delivers all of its bullets within their effective velocities. As before this condi-

tion will be maintained so long as $\frac{\theta}{2} - \epsilon$ is less than the angle of

fall. Under the conditions of this high-angle fire the two factors become equal at a range of about 1000 yards, within which the power of fire again begins to fall off. But when the enemy get within this range, our infantry will have taken a prominent part in the game. Generally, for battle purposes, more than one reduced charge is not practicable or desirable, nor even necessary if the velocity with the full charge does not make the trajectory too flat. The shorter the range for high-angle fire, the shorter that at which it begins to fall off in efficiency. In the above instance the fire will remain good down to about 800 yards, and if the artillerymen stand to their guns until the infantry of the enemy with modern arms gets within 800 yards, there will not be many of the artillerymen or of their horses left to take an interest in the subsequent proceedings.

With but two charges, the fuse can readily be given a double graduation, as described and illustrated in the *JOURNAL* of September, 1888, together with one form of telescopic sight. Some form of the latter is the vital necessity of the day. If a practica-

ble and satisfactory telescopic sight cannot be perfected, there is no necessity for wasting any more time or money in a further development of the gun, as its range and power already far exceeds what can be utilized without the aid of greatly improved sights.

It will be noted that the maximum angle of elevation for high-angle fire,— $11^{\circ} 28'$,—is considerably less than that required for 5500 yards with the full charge. This gun admits of an elevation of 20° , which will give a range so great as to be impracticable in battle.

The fuse must be graduated the same as the sight in yards, and so as to insure a proper burst at any range without any precaution other than to set it to the range. It has been seen that the "pattern" desired for the shrapnel here in illustration, is a front of 30 files of infantry. But the angle of the cone of dispersion varies with the ratio of the initial to the final velocity, being a minimum at the muzzle; consequently, to insure the constant pattern the distance of burst in front of the target varies inversely as the range. All that is necessary is to lay off on the scale the time of burning for a given range, less the time for the distance at the end of the range which the shell must burst short. This done, the sight will indicate the range to the gunner and also that at which his fuse must be set, and he has only to compare the two as the gun is loaded, to insure correctness. It will require a little time and patience to work out a table of corrections, but this done it will be no more trouble thus to graduate a fuse than to do it otherwise, and it will be much better done in the quiet and safety of an arsenal, than by any gunner or officer in the excitement of battle. It goes without saying that the rate of burning of the fuse must be determined by actual firing with the standard velocity, no matter how it may be graduated. Such rate is never constant, and consequently any graduation in equal parts is valueless.

It thus becomes evident that the conditions of field artillery fire with shell burst on graze, and of shrapnel burst in the air, are widely different. In the case of the shell a flat trajectory was essential to keep the fragments near the ground and render them effective. On the contrary with shrapnel a definite angle of fall is necessary to bring the bullets to the ground with effect, and as soon as the angle of fall is reduced below this, the effectiveness of some of the bullets is lost, the number increasing as the angle

diminishes. Consequently the problem to be solved is not the securing of the highest possible muzzle velocity with a light projectile, but with the heaviest permissible projectile of good sectional density to secure the lowest initial velocity which will give satisfactory results. For any given gun, the weight of projectile, bullets the shrapnel is to contain, and the maximum range having been determined, the initial velocity at once becomes known, to increase which is to impair at once the effectiveness of shrapnel fire.

THE POWER OF MILITARY COURTS TO PUNISH FOR CONTEMPT.

By R. MCKINLAY POWER, M. A.,
OF THE NEW YORK BAR.

THERE is this one striking point of resemblance between the Military Code of the United States and the Excise Code of the State of New York—that both are full of defects. Both require to be thoroughly overhauled and extensively amended, and both are unfortunate in the fact that Congress seems as unwilling to amend the former as the State Legislature is to revise the latter. The one hundred and twenty-eight articles which comprise the “rules and regulations for the Government of the Armies of the United States” are a heterogeneous mass of redundant rubbish, and no non-commissioned officer should, in these days of examinations for promotion, be esteemed worthy of a commission who could fail to devise a superior system of military jurisprudence.

The refusal of two civilian witnesses to testify before a general court-martial which recently convened in New York City for the trial of a field officer of the United States Artillery presents a serious instance of what seems to be universally accepted in army circles as one of these defects in its military code and has served to call attention to the important and vexed question: Can a military court punish as for contempt a civilian witness who refuses to testify before it? Although not entirely free from doubt in the matter, the writer is constrained to return an affirmative answer to this question, and the object of this brief paper is to show that such a power is vested, both at common law and by the statute, in every properly constituted court-martial of the United States.

So far as the Military Code proper or the Articles of War are concerned, it may, at the outset, be stated that none of these articles provides, in express terms, for the punishment of this species of contempt. The 86th Article is the only article which provides for contempts at all, but that article hardly meets the case in point, for it merely declares that “a court-martial may

punish, at discretion, any person who uses any menacing words, signs or gestures, in its presence, or who disturbs its proceedings by any riot or disorder." It is also conceded, *in limine*, that this article and certain provisions of the statutes to be hereinafter referred to embrace the whole statutory law upon the important subject of contempts committed, either by soldiers or citizens, with reference to the proceedings of military courts. Of course, the fact is not overlooked that, if the refusal to testify were committed by a commissioned officer or an enlisted man, charges under the 61st Article of War might doubtless be preferred against the former for "conduct unbecoming an officer and a gentleman," and against the latter, under the 62d Article, for conduct "to the prejudice of good order and military discipline," or against both officer and enlisted man under the latter article.

The power to punish for contempt is an inherent power as well as a necessary attribute of every court. It is a branch of the common law and is part of the law of the land. This power all superior courts have possessed from "time whereof the memory of man runneth not to the contrary," and it has not been taken away or abridged either by the Constitution or by statutory enactment. Without such a power every court in the land, civil and military, must lack its most essential safeguard for the due and orderly administration of justice. Sir William Blackstone, writing upon this subject in the Fourth Book of his Commentaries, says that "the process of attachment, for these and the like contempts, must necessarily be as ancient as the laws themselves. For laws without a competent authority to secure their administration from disobedience and contempt would be vain and nugatory. A power, therefore in the superior courts of justice (either civil or military) to suppress such contempts, by an immediate attachment of the offender, results from the first principles of judicial establishments and must be an inseparable attendant upon every superior tribunal. Accordingly we find it actually exercised as early as the annals of our law extend." The power of all superior courts, including the King's Military Court or the Court of Chivalry, which was the prototype of the court-martial, to punish for contempt was, therefore, part and parcel of the *lex non scripta* or common law of England. In our own country Mr. Chancellor Kent, after remarking to the same effect, says: "It is not to be doubted that the Constitution and laws of the United States were made in reference to the existence

of the common law. * * * In many cases the language of the Constitution and laws would be inexplicable without reference to the common law; and the existence of the common law is not only supposed by the Constitution but it is appealed to for the construction and interpretation of its powers." While, strictly speaking, the United States, in their federal capacity, have no common law proper, it is a fundamental principle with which every law-student is familiar, that this country adopted the common law of the mother country so far as it was applicable to our circumstances and conditions, and that that common law prevails and is in full force and effect in this country, save only in those cases where it has been changed or abrogated by statute.

It has never been denied that the common law is the sole authority for innumerable principles and practices in our military jurisprudence; and, indeed, the Military Code expressly recognizes its existence and binding force. There is neither statute nor regulation which allows of the enlistment of soldiers on Sunday, but such enlistments, by the common law, are unquestionably legal, and the Court of Queen's Bench in England has expressly so held. (*Wolton v. Gavin*, 16 Q. B. Rep. 48.) Again, Congress has been very careful to enumerate what persons may and what persons may not be enlisted or mustered into the military service of the United States, and I do not find that there anywhere exists any statute which authorizes or sanctions the enlistment of aliens. Nevertheless, the validity of the contract, at common law, has been sustained, and the enlistment held to be lawful. This was the decision of the court in the case of the *United States v. Wyngall*, reported in 5 Hill, 16, and it is probably true that one-third of the enlisted men of our army were aliens at enlistment. Our naturalization laws, moreover, recognize the validity of such enlistments by providing for the admission to citizenship, without the previous declaration of intention, of persons who have served enlistments in the army and navy. By *special statute* every officer of the *Navy* must be a citizen, but it is nowhere required that citizenship shall be a condition precedent to accepting a commission in the army.

It is not at all necessary that every exercise of judicial authority should have for its foundation or sanction an act of Congress. The wheels of justice in every court, whether civil or military, would speedily be stopped were it necessary in every matter to say *ita lex scripta est*. A general court-martial may not

be a "court of record" in the strict legal acceptance of that term, but it is a court of supreme and general military judicature. It has, in time of war, jurisdiction to try capital cases and to impose sentence of death; to inflict discretionary punishment and sentence to imprisonment in a penitentiary; to issue subpoenas requiring the attendance of both military and civilian witnesses and to send its process into every State of the Union; to issue process of attachment against civilian witnesses who fail or neglect to appear before the court and testify in any case; to administer an oath or affirmation to a witness and "to punish, at discretion, any person who uses any menacing words, signs or gestures in its presence, or who disturbs its proceedings by any riot or disorder"; to issue commissions for the examination of witnesses on interrogatories, and to regulate and determine its own procedure untrammelled by the orders of the convening authority. It possesses, in short, the requisites and incidents of a court of record, and every court of record in the land possesses the common law right to punish for contempt of its proceedings and authority.

The power of the two Houses of Congress to commit for contempt may properly be here cited by way of analogy. These bodies possess no *statutory* authority to deal with contempts *committed by other than their own members*. Nevertheless, the Supreme Court of the United States, in the case of *Anderson v. Dunn*, reported in VI. Wheaton, page 204, expressly decided that either House had such power; that it was an implied power, and of vital importance to the safety, character and dignity of the House, and that the necessity for its existence and exercise was founded on the principle of self-preservation.

By Section 1202 of the Revised Statutes, Congress has given to general courts-martial "the power to issue the like process to *compel* witnesses to appear and *testify* which courts of criminal jurisdiction within the State, Territory or District where such military courts shall be ordered to sit may lawfully issue." Such a grant of power, it is contended, carries with it, by necessary implication, a grant of the same power which the courts of criminal jurisdiction within the State, Territory or District possess of punishing disobedience to their mandates. The grant of a specified power includes also, as a necessary and inseparable incident of that grant, all the known and usual methods of exercising the power. The delegation of certain express and enumerated pow-

ers does not, of necessity, imply the reservation of non-enumerated powers nor forbid the exercise of the same. *Expressio unius* does not in all cases import *exclusio alterius*. To say that general courts-martial may compel, by attachment, civilian witnesses to appear and testify before them, but that thus far may they go and no farther, is a veritable *reductio ad absurdum*! If the words of this statute—"like process to compel witnesses to appear and testify"—do not confer the power to punish for wilful refusal to testify in obedience to that process, I hardly know what any words in the English language can mean. It is submitted that the plain and reasonable intendment of Section 1202 of the Revised Statutes confers this power upon general courts-martial, and that such courts of the army have just as much power to punish civilian witnesses who refuse to give evidence before them as courts of the navy have with respect to such contempts by the express terms of Article 42 of the Articles for the government of that branch of the service.

It is very evident that it was never within the contemplation of Congress to deny to military courts this absolutely necessary and indispensable power of punishing for contempt, and it is apprehended that it has not failed or omitted to do so. By the 86th Article of War, before cited, it has conferred upon courts-martial the power to punish, at discretion, all persons—civilians as well as soldiers—for almost every species of contempt committed in their presence; and by the Judiciary Act of 24th September, 1789, ch. 20, sec. 30, and the Act of January 24, 1827, ch. 4, sec. 1 (both of which statutes are general in their application) it has provided for the taking of depositions, under a *dedimus potestatum* and *in perpetuam rei memoriam*, to be used before military courts, as well as for the punishment of any witness who refuses or neglects to appear before the commissioner, or, after appearing, refuses to testify. It has also, by section 2 of chapter 4 of the last mentioned act, made provision for the issuance of subpoenas *duces tecum* under a *dedimus potestatem* and for the punishment of a witness for failure to produce the documents called for. It is quite inconceivable and "beyond the mark of thought" that the wisdom of the Legislature should have declared that the necessary and material evidence of a civilian required in a prosecution pending before a duly constituted and properly created military tribunal might, *if taken before a commissioner*, be compelled by fine and imprisonment, and at the same time have designed that the same

witness, *when produced before the court-martial itself*, and there taken the solemn oath prescribed by the 92d Article of War, and called God to witness that the evidence he should give would be "the truth, the whole truth and nothing but the truth," might nevertheless defy the court with impunity and refuse to open his mouth! If the court-martial appointed for the trial of the field officer before referred to had been ordered to sit in any other State than New York, as it might lawfully have been so ordered, the contumacious witnesses could have been compelled to appear before a commissioner in this State for examination, and their refusal to testify before that official could have been punished by the judge of the court whose clerk issued the subpoena for their attendance, in the same manner and to the same extent as disobedience to process of subpoena to testify before such court may be punished. It is, I apprehend, both illogical and absurd to suppose that the court-martial has not the same power over witnesses declining to testify *in its presence*, and it must not be presumed that Congress intended to produce such an inconvenient and repugnant result.

From the foregoing reflections and citations it would thus appear that military courts have abundant authority to punish for all contempts of their proceedings, and that civilian witnesses who refuse unlawfully and in material matters to testify before them, and to render obedience to their valid process, may not only be adjudged guilty of contempt but may be punished therefor. It being a settled principle that, where statute has assigned no specific penalty to the commission of an offense, fine and imprisonment must be the measure of punishment, it would also follow that courts-martial have likewise the power thus to punish the civilian witness who refuses to testify.

It may not be uninteresting to observe, in closing this paper, that the trial which has prompted the foregoing observations has not been the first or only case in which a civilian witness has refused to give evidence before a military court of the United States, although it is "a consummation devoutly to be wished" that it may prove to be the last. In 1885, a general court-martial was convoked at Fort Clark, Texas, for the trial of certain officers upon charges of gambling, and Mr. Kraty, the County Attorney of San Antonio, who was subpoenaed as a witness, declined to testify before it, and denied the power of the court to compel him to do so or to punish his contempt. Commenting upon this case

in its issue of October 10, 1885, the *Army and Navy Journal*,—the official organ of the service—contended, although without argument of the question, that military courts of the United States possess ample authority to deal with such contempts; and, as the author has herewith endeavored to show, he believes that the Journal was sound in its general conclusion and construction of the law. If, however, the highest courts of our army do not in fact possess such power, it is an anomaly that should no longer be suffered to exist, and Congress ought to lose no time in effectually conferring it.

Comment and Criticism.

(The remarks under this head have, generally, been invited by the Publication Committee, which desires that, as far as practicable, these "Comments" should appear under authors' names.)

I.

"A United States Army."

Col. J. G. Gilchrist, 3d Regiment Iowa N. G.

LEUTENANT BATCHELOR'S article on a "A United States Army" in the January JOURNAL, is one that should receive a very careful consideration, much more so than the limits of the space occupied by *comment* will permit.

The remarks on the status of the National Guard are novel, but undoubtedly correct. I do not know that the position there taken has been presented before, at least it has never attracted my attention. Probably it is a fact, *de jure*, that the existence of such a force is unconstitutional, and equally true that the tacit consent, or partial recognition of this force by Congress and the national authorities, confers upon it a sort of legitimacy. As a matter of fact, however, the laws of many of the States contain a provision similar to that of Iowa, which reads that the military forces of the State shall consist of "the active militia," to be designated "the Iowa National Guard," and the unorganized militia, which is to include all persons between certain ages, and who are not exempted from military duty by statutory provisions, etc. In consideration of this voluntary service, the officers and men of the National Guard are exempted from jury duty and poll tax. As far as statute law can do so, the National Guard is the tangible representative of the militia of the State—the term "militia" is associated with so much of shame and disgrace in the past history of our country that the word is offensive to the Guardsman, and probably has something to do with the adoption of the somewhat objectionable title of "National Guard." However, this is only *en passant*. Lieutenant Batchelor may be right in his law, but these State armies do exist, and the question is, how can they be made efficient? Those of us who are in the State service know well what none can know who are not in it, with what difficulty we keep up our organizations. Every legislature has few or many members who have a hatred for all things military, constantly seeking to withdraw all support from the State troops. It is only by the exercise of unceasing vigilance that we escape annihilation from one year to the next. There is but one way to put the State service on a solid and enduring basis, viz., a war which will demonstrate the value of the troops partially trained in times of peace, or civil commotion that will find the civil authorities powerless without military aid. Congress or State legislatures will never give more than they now give to State military organizations, and it would imperil the existence of these organizations to make an energetic demand for it. No, we must be content with what we now have, until some sorely needed service is done by the Guard, and then the opportunity may be embraced to make a demand that will chal-

lenge attention. But we can ask for legislation that carries no money appropriation with it, and we should be very clear in our own minds just what we want.

Now here is where the average Guardsman and Lieutenant Batchelor drift apart. His scheme is ingenious, logical and unanswerable from all points of view save one, and that is, it is utterly impossible of attainment. The *preferment* of the request would raise up hosts of adversaries, and the whole military organization of the States would be wiped out of existence. Admitting this lamentable state of affairs, what *can* be done to increase the efficiency of the State troops? Not practice marches, and prolonged tours of duty, for the men concerned have their families to support and cannot give the time. A very simple matter lies at the root of the whole thing, in the estimation of many men of long service in the Guard. Abolish the elective system for all officers above the grade of second lieutenant, and make the tenure of office for good behavior. How will this effect much of a reform? Let us see.

I take it to be a truism, that the best troops, all things being equal, are the best *drilled*. Discipline is not to be despised, of course, but discipline is an outcome of *drill*. It is the fashion to depreciate mere drill, forgetful of the fact that drill means subordination, and renders bodies of troops manageable. The loose order German drill regulations may answer for soldiers of long and continuous service, but would surely be disastrous if applied to bodies that were only occasionally soldiers. The best drill, that is the best *results* of drill, can be had only from officers who are reasonably secure in their positions, and not subject to the caprice of the men in their command. If an officer attained his grade by regular promotion, and secured his commission therein only as a result of a carefully conducted examination, the efficiency of the State troops, I venture to say, would be doubled in the first year. There would be a radical change in personnel, but nothing but good would result therefrom. I consider all other evils in the State system as nothing compared to this of election of officers. Closely, yes inseparably connected with this is the matter of appointments to the head of staff departments, notably the Adjutant-General. Such appointments should come from the line of the Guard, and be endorsed with perpetuity, establishing a retiring age of course.

The subject opened up by Lieutenant Batchelor is too vast for brief mention; pages might be filled, for it is truly a burning question. There can be no doubt that the proper course to pursue is not to ask for larger appropriations, and an extensive reorganization, but to make haste slowly, correcting glaring evils, one at a time, not too much attempted at once, thus creating active opposition—and of all the evils I know of none greater than the pernicious elective system, which brings methods of the politician and "society"-man into military affairs, which can never be anything else than hurtful. Get rid of *this* first, then go a step farther.

Col. Theodore W. Goldin, Wis. N. G. (retired.)

I have read with much interest the article of Lieutenant Batchelor on "A United States Army" in the January JOURNAL.

The grounds of apprehension of future foreign complications, and even the possibilities of grave internal dissensions as outlined in this article, have long been a source of much concern among thinking officers of the National Guard of the United States.

That we must look to the general government to provide the means to meet these dangers we have always felt, but just what methods were to be pursued to accomplish the desired end, has always been an open question.

In 1885, I think it was, a series of questions, emanating from the War Department, were submitted to regimental commanders in this State, and I have no doubt in others, touching the number of men in their several organizations available for frontier

and interior defense in case of sudden emergency ; the length of time it would take to equip them and concentrate them at certain given points ready for field service. What the results of those inquiries were, we have never learned, but doubt not they would have afforded food for study for both officers of the army and the National Guard.

That we are practically without national protection at the present time is too self-evident to need demonstration. Our standing army is hardly worthy of the name, it is but little more than a detachment, and were we to be subjected to an invasion would afford but slight opposition to an invading force.

The question as to how the National Guard can be made an available means of national defense without arousing the prejudice of the American people toward that terrible bugbear—a standing army—is not a new one to officers of the National Guard.

We have felt for years that we occupied rather a peculiar position, acting under the authority of our State, armed and to some extent equipped by the Government, and yet having no legal status in the eyes of the nation.

The plan offered by Lieutenant Batchelor seems feasible enough with perhaps some modification of details. But the first thing we are called upon to meet is the size of the appropriation. This seems large, especially so when looked at with the eyes of a people still inclined to hold to the antiquated opinion that America is a nation of soldiers, and that in case of war or an internal uprising the first call for troops would bring into the field an army sufficient for every need. That this is arrant nonsense, every American citizen who has received even the rudiments of a military training, knows to be a fact.

It has occurred to me that it might be feasible to secure an appropriation that would enable us as a starter to bring say half the present strength of the National Guard within the provisions of this plan. This would be a gain and a foundation on which to go in and ask for more.

Another thing, it is as yet an open question whether the National Guard, as a whole, is ready to enter into a plan embodying so many radical changes in existing methods.

That this change would be for the benefit of our Nation as well as for the benefit of both the army and the National Guard, I am at present freely inclined to admit.

I think, however, that should this plan be undertaken it should be materially modified, and I will suggest a few of the changes which occur to me :

1. No officer should be commissioned until he has passed a prescribed examination, tending to show his fitness for the position.
2. Officers should not be commissioned for a term less than that for which their commands are mustered into the service, subject of course to removal at any time for inefficiency or other reasonable cause.

To commission them for one year only, would leave them liable to removal at a time when they are just beginning to be of value.

3. Promotions to positions of field officers, should come in regular line of promotion, rather than by election by line officers,—a plan we have found very unsatisfactory in our own State. Of course promotion should be made only after a satisfactory examination and upon the approval of the Governor and the State Inspector, approved by the Secretary of War, and subject to removal as in the case of line officers.

The course of training should be radically changed from the present methods, and there is no time better than the present, when not only the army but the National Guard are changing the tactics so long in use.

One of the great lacks of the Guard is training in field duties, and in other things they would find absolutely essential in time of active service.

I do not think one per cent. of the National Guard has ever made a practice march,

and not two per cent. of them would know what to do if supplied with their rations and compelled to cook for themselves, as would be likely to be the case were they ever sent out for active field duty.

Camps for troops mustered in under the plan advocated in this article should be so arranged for as to allow at least a full week for the tour of camp duty, and wherever practicable, troops from the regular army should be put in camp with them, and the evolutions conducted or the instructions given should be participated in by the officers and men of both commands.

I think a plan embodying the appointment or detail of officers in the State other than the State Inspector, could be made of great advantage. For instance, suppose with each regiment mustered in an army officer was detailed, whose duty it should be to visit as often as was possible the several companies in his regiment for the purpose of supervising their instruction, correcting their errors, and being in touch with them at all times.

But all these matters are still in the future, the first thing to be considered is, will it be possible to secure the coöperation of the National Guard in forming a plan for closer union for National defense; the next thing is to adopt the plan deemed most feasible; and the third thing is to go to work with a will and by all moving in the same direction, secure the necessary consent of Congress, together with the sinews of war in the shape of an appropriation sufficient for our needs.

I am satisfied that the general features of the plan suggested by Lieut. Batchelor are feasible, and will on the whole meet with hearty sanction on the part of the National Guardsmen.

**Lieut-Col. Thos. F. Edmonds, Comdg. 1st Corps Cadets, Mass. V. M.,
Brevet Colonel U. S. Vols.**

Lieutenant Batchelor has presented a very interesting paper. He gives a graphic sketch of the largest piece of unprotected property in the world lying loose as a temptation to any foreign power that may choose to loot it, and shows how the owners of this property, unarmed and trusting only to their size, jostle constantly about, often in a swaggering style, amongst a set of jealous competitors more or less impecunious and armed to the teeth. This has been told before; but it cannot be too often repeated while the people of the United States remain defenseless.

Lieutenant Batchelor also makes two important points—one a question of fact, the other of practicability.

He states what is probably an undeniable technical fact when he says that the militia exists only on paper. There may be a few exceptions where certain ancient military organizations in existence in 1792, and still in existence, are protected by the act passed by Congress in that year; but in general it may be said that the Militia of the States, unless it conforms precisely to the antiquated National law, does not legally exist.

This view of the case is of course the lawyer's view, purely technical; yet it might be also the view which a court would take, and some very awkward situations might ensue; as, for instance, where rioters opposed by military force and injured, sued citizen soldiers for illegal assault or perhaps for murder.

Before noticing another point, also technical, to which allusion will be made further on, let us see how the matter would strike those who, disregarding the narrow view on a nice law point, would argue in the light of common sense and custom.

If Lieutenant Batchelor says that the States have no legal right to change the name of their forces from militia to National Guard, he is undoubtedly correct. No warrant exists for the change, which is, moreover, in bad taste, as an imported designation redolent of Paris, whence it came tainted with an odor of cowardice and insubordination;

but in many of the States,—whatever may be the case in others,—the so-called National Guard is a part of the militia, precisely as the State of Massachusetts, for instance, which has no National Guard, keeps a portion of her enrolled militia in a condition of efficiency under the name of the Massachusetts Volunteer Militia.

In April, 1861, the 3d, 4th, 5th, 6th and 8th Regiments of this same Massachusetts Volunteer Militia went into the United States service at a day's notice under a call for militia from the President. Those regiments were direct descendants of the old militia. The 5th, 6th and 8th Regiments survive to this day. Nobody has ever questioned the fact that they were militia. How then, if Lieutenant Batchelor is correct, shall we class the 7th New York which went to the field at the same time? Then, as now, the Seventh was a part of the militia of New York, and responded as such to the President's call for militia, although, then, as now, it was called "National Guard." "What's in a name?"

The term "militia" is a good plain word belonging to the United States language; it is legal, and there can be no mistake about it. If the States so elect they can keep their militia, or such part of it as they see fit, in an efficient military condition; but if, as Lieutenant Batchelor assumes, there are in any of the States armed forces not militia, then there ought to be a sharp bit of overhauling done forthwith. Were such a course taken, it is probable that every State would promptly proceed to try and prove that its so-called "National Guard" was misnamed.

Coming back however to the technical side of the question, let us see whether the Constitution sustains another view.

Section 10, Article 1, of the Constitution of the United States, in its concluding paragraph reads:

"No State shall, without the consent of Congress, lay any duty on tonnage, keep troops, or ships of war, in time of peace, enter into any agreements or compact with another State, or with a foreign power, or engage in war, unless actually invaded, or in such imminent danger as will not admit of delay."

Lieutenant Batchelor quotes the words: "Keep troops in time of peace"; and he says that the States do keep troops which are little armies, not militia.

Here is a question which the States must be brought into court to decide, unless it is so self-evident as to decide itself. It is one of definition, to determine the meaning of "keeping troops" in the Constitutional sense as distinct from "militia."

The Constitutional meaning of "troops" would seem to be "armies," and the meaning of "keep" would seem to be in the sense of permanence. Section 8 of Article 1 recognizes the militia and that it must be trained. The States must be granted reasonable means of so doing. But there is a vast difference between devoting reasonable time to this object and "keeping troops." A week or ten days of armed duty in each year, and weekly drills customarily of one or two hours in the evening, cannot reasonably be construed as maintaining a permanent army.

This question of the legality of the militia crops out every few years. A paper upon its purely legal aspect would be instructive, especially if it could show whether any court had ever met the matter squarely; and if not, why not.

The States, finding it as useless and ridiculous as it was impossible to adhere to the antiquated customs and equipments and to get along with only the officers and limited or cumbrous machinery of the old law, have made alterations or additions of their own as common sense and necessity dictated. This has been done openly and above-board by the legislatures of the States, and in so doing it is not unlikely that some of the alterations have gone so far as to antagonize some of the provisions of the National law or to create a possible conflict of authority between the National and the State executives; but there is probably no one who doubts that such action was unintentional.

The second point for argument in Lieutenant Batchelor's paper is the practicability of his scheme for enlarging and utilizing the State "troops." His idea is to legalize the so-called "National Guards" and develop them into a sort of supplement to the army.

He proposes that the citizen soldier,—his designation is immaterial,—shall do certain things. Just here is where the shoe pinches. The citizen soldier cannot be a citizen, earning his living, and a soldier doing what Lieutenant Batchelor expects of him. Nearly every regular officer who has written on the utilizing of militia as effective troops for use at short notice, has failed just as much to understand militia, as the militia would fail to carry out the elaborate paper ideas laid down for it.

The citizen soldier has decided limitations. If he is pressed too hard, he flies off the hooks into private life whence he came. Except in rare cases he is a transient being. It is a significant fact that militia officers never propose grand plans for him.

It is vastly more practicable to enlarge the army than to semi-mobilize the militia. This may be seen by any officer who will take the time and trouble to investigate. Such an one must go and live among the men who compose the militia and study their habits, their means of subsistence and their ability to devote time to military duty. As yet only a very few regular officers really know anything about such an inside view, and no man is qualified to draw a plan for the training and conduct of militia until he has had an opportunity for a special study of it, made in its midst.

For instance, it is, perhaps, a very small thing to pick out of his scheme, for special notice, the suggestion Lieutenant Batchelor makes, that camps be extended every other year from one to two weeks; but, small as it seems, here is a rock to wreck his plan at the very start. Occasionally enthusiasts may be found in the ranks whose circumstances will permit them to serve for extended periods; but experience shows that one week, or at most eight days—from Saturday to Saturday inclusive—is the longest practicable term for the militia encampment or tour of any sort.

The men are mostly artisans, or clerks upon small salaries, with a limited number of farmers' boys. Few of them are independent, and a large proportion of them, having but one week in each year allowed them as vacation, devote it to their encampment. If more time is demanded of them they must step down and out, because their employers have something to say on the subject.

Regular officers, seeing superficially what the militia-man has been made to do, are apt to overlook the strain already put upon him, and hence they misconceive the possibilities that are in him.

There seems also to be misconception in Lieutenant Batchelor's remark that some organizations of militia in camp are fed from restaurants. So they are. So are the cadets at West Point. The volunteer militia of a State, its small picked force, maintained for the purpose of instruction, to the end that regiments of volunteers may be the more readily officered in time of war, corresponds to the whole of the militia of the State and to the volunteers called out in war time, as the Military Academy does to the body of the army; that is to say, the volunteer militia is essentially a school for officers. The States are obliged to order matters in such a way that the greatest amount of instruction shall be given in the hours available. At the same time they are forced to consult a rigid economy. It is very desirable, of course, that a soldier should know how to cook his own food; but he is a very wasteful animal until he knows how to do so; he has other things equally important to learn; and, on the whole, as appropriations do not flow too lavishly from the State treasuries toward the militia, economy has established the camp restaurant or catering system very much after the manner of West Point.

In the States where volunteer militia is well established the people are proud of it,

and the wise militia-man fosters this pride, but he knows that he must not ask for too large a force and he must not in general make his demands so great as to try the patience of his best friends, the voters.

Such being the condition of affairs within the States, it is evident that if additional force is necessary, it must be created by the General Government. Aside from this so-called National Guard, which, according to Lieutenant Batchelor's position, is neither "fish, flesh, fowl, nor good herring," we have already—1, The Army; 2, The Volunteers (in war); 3, The Militia.

The army should be always ready. The volunteers lie dormant until actual war calls for their organization, anew for each war. The militia exists permanently on paper, with limited possibilities as to active duty for instruction or effective numbers for mobilization. Volunteers, if leavened by active militia experience and a sprinkling of regular officers, can be made into fair infantry after six months' home instruction in camp and a year's field service. The raw levies of an enrolled militia drafted into active war service are not worth the powder it would take to blow them out of the world, if they could be got near enough to powder enough for the job.

The force that is always ready is therefore the one on which the country must rely—the Army. If Lieutenant Batchelor's proposed supplement to it is impracticable by reason of the nature of American life, and the money appropriated for it would be wasted, the next thing and the only thing to do, is to put an increase on the regular army and so build it from a mere skeleton to a vigorous body with muscle and force. This is what ought to be done, and the doing of it will not be such a difficult matter as many suppose. It is only necessary to make public opinion, and apply it, to force proper legislation.

What the army wants is political friends; and it does not know how to make them. They are not to be found among the politicians at Washington, but in the homes of the voters who elect and control Congressmen. In these same homes will be found the militia-men, voters also. They are the best friends the army can have. They do not want any more books written for them at present on grand tactics or manœuvres that they have no time for; yet if they are properly treated, they not only will be quick to see what is needed, but willing and even anxious to have the right thing done.

The people at large are not against the army. The bulk of them never see any of it and never give it a thought, except when they read some newspaper paragraph about it in connection with Indian affairs of which they know as little. All they require is acquaintance, and that is the direction in which the army, aided by the militia, should work.

No State in the Union should be without a detachment of at least a battalion of four companies of regular troops quartered and recruited within its limits. The larger States should have a regiment or more in proportion to population. This remark applies to infantry, the cavalry to be located according to the needs of the service and the best regions for supplies of horses, the artillery to be distributed in relation to the sea-boards and lake-fronts independent of the infantry and cavalry stations. The depots should be permanent, and troops ordered away from them for special service, either for field manœuvres or for more serious duty, should be returned to them as soon as that service had been rendered. This means local recruiting and consequently local pride. The States, once accustomed to the troops, would take such an interest in them that they would see them depart, even temporarily, with regret, and welcome them back with satisfaction. In this way the regulars would share local pride with the militia; nor would the citizens who thus became attached to their regular regiments, allow them to be tampered with politically. Moreover, the example that the army could thus furnish to the militia as its fugleman to show what should be done and how it should be

done, would be of the greatest benefit to the State troops. It is no exaggeration to say that the militia, with regulars in their midst to copy from, would be twice as effective in a military sense as without them. There is no reason why militia should not, within proper bounds, say for one week in every second or third year, join regular troops in field exercises.

Nor is this all. Lieutenant Batchelor is perfectly right in what he says about the present condition of the general militia law now in force dating back to 1792. A new statute is needed. Several attempts have been made to pass one, but all have failed, principally because no act has yet been devised that the States have been willing to support with any degree of unanimity. Nor can any act pass which depends solely upon the militia itself.

The different systems in vogue among the several States can only be harmonized under a careful study of them by impartial experts. Such experts are at hand in the officers of the regular army. They are disinterested parties possessing the respect and confidence of the militia, and they only need time, say three years, to study the matter. This may seem a long time, but the subject is a large one and cannot be properly understood until the militia has been observed during at least that period. Three officers should be detailed for each State. They should be allowed mileage to observe other States when they could do so without neglecting the particular one to which they were detailed. At the end of the three years—or more as might be decided—these officers should meet in convention and draft a statute which should be informally adopted for further discussion at a second convention to be held one year afterwards, during which time the officers should return to their State stations and make up their minds deliberately concerning the merits or demerits of the proposed statute. The second meeting should adopt a statute, the original one or an amended one, as a majority vote of the convention might decide. Such a statute would naturally contain a military system adapted to the needs of the country, and would be easily enacted by Congress.

What is said here about the army, applies equally to the navy. Every sea-board State should have one or more battle-ships adapted to the waters of its coast constantly in commission, not only for naval recruiting and practice, but for the training of the naval battalions of the militia.

Meanwhile, the country must take its chances unless some miracle or some calamity metamorphoses politicians into patriots and gives us a respectable army. If that does happen, the army will find its best friend and its firmest support in the militia, through which it must persistently and consistently labor to create public opinion favorable to it.

Lieutenant Batchelor's paper has not suggested this idea. It is an old one. But his article has given an excuse for writing out the suggestions herein. He has given a thoughtful presentation of his subject and has arranged his material with skill and force. A little further acquaintance with our militia may cause him to alter some of his views, and he may like to correct some of his words, such for instance as his rather too sweeping statement that "Target practice is practically non-existent"; but knowledge will come with experience, and he is certainly now entitled to hearty commendation for an exceedingly well written essay.

Reprints and Translations.*

THE PROGRESS OF TACTICS FROM 1859 TO 1890, AND THE ATTACK OF THE FUTURE.

By MAJOR-GENERAL VON BOGUSLAWSKI.

From the German.

By CAPTAIN GAWNE, FIRST ROYAL LANCASHIRE REGIMENT.

(The United Service Magazine, London.)

THE latest editions of the cavalry, artillery, and infantry regulations of the German army may be said to mark the conclusion of a change in tactics which dates from the Italian campaign of 1859.

Though the value of rifled arms had been conceded by their universal adoption for some years previous to that war, we here saw the French infantry, with a smooth-bore armament, and formed in masses of skirmishers, push close up to the Austrians, and after a short fire-action, overthrow them by an impetuous charge.

Such were the characteristic features of most infantry encounters in this war; and the success of the French tactics created a strong feeling in favor of a direct attack ending with the bayonet. In Prussia this was generally accompanied by strong bodies of skirmishers. The Austrian infantry, however, adopted shock tactics in close order, in the form of divisional columns.

Owing to the peculiar ground on which the Danish war was fought, the breech-loader, except once, did not show itself to advantage. The exception was at the skirmish at Lundby on the 3d July, 1864. Here the breech-loader not only shattered but almost annihilated the attack of a doubly superior force; but the significance of the result was neither recognized nor valued by foreign armies. The successful Austrian attacks on Königshugel and Oberselk, and the great gallantry displayed there, were more dazzling, and attracted therefore more attention.

The true value of the breech-loader and of the Prussian fighting tactics was not realized till the campaign of 1866. Here, although the Prussians nearly always took the offensive, they, at the proper moment, readily adopted the defensive. The gallant attacks of the Austrians and their allies, at Skalitz, Gitschin, and other places were repelled by the terrific fire

* Please address communications concerning reprints, translations and reviews to Lieut. J. C. Bush, editor of this department.

of Prussian skirmishers and their supporting lines. In petty skirmishes, also, Prussian company leaders, by skilful handling of the company column gained marked advantage over their opponents. The superiority of the breech-loader was apparent, not only in the defense but also in the better preparation of the attack.

The minor rôle played by the Prussian artillery in 1866 was due not merely to its armament being partly smooth-bores, but also to the fact that its tactical employment was bad, and that with few exceptions an insufficient use was made of it.

When occasion served, the cavalry encountered the splendid Austrian horsemen with undoubted dash, though as a rule, the handling of cavalry masses on the battle-field left much to be desired. Of the strategic reconnaissance, the less said the better. Absolutely no use was made of the engineers.

Since 1866 the unceasing and enormous development of tactics has brought about an almost identically similar method of training for fighting in all European armies.

If we examine the factors which have brought about these present methods we shall find chief among them practical experience in war, the ever-watchful eye of the great Emperor, and more especially the production of accounts of the battles as they actually occurred and as they were narrated by the army. The value of such publications is inestimable. The student must, however, carefully winnow them, and often in this process reject much. Official accounts can never entirely replace these relations, since they are incapable of giving a life-like picture of the minor tactics which they are intended to explain and illustrate.

Let us now enumerate very briefly the stages of recent tactical progress, without naming the pamphlets that suggest them.

First come infantry tactics. It has been pointed out that victory had not depended merely on the needle-gun and the actual Prussian method of fighting, but also on the *morale* of both officers and men, and on their training, which combine independence with discipline. At the same time attention has been called to the excessive dissolution of tactical units in the battle, and to the higher leaders being seldom if ever able to exercise immediate control over the fight. Further, that the old drill movements, particularly in battalion formations, had proved for the most part impracticable, with the exception of company columns and skirmishing formations. The favorite subject of general discussion by the army, after 1866, was "The attack of infantry armed with breech-loaders."

It was generally conceded that such an attack would require a stricter fire discipline, a wider application of skirmishing, and a really practical battle-training. To obtain these conditions many formations would have to be abolished, and others more suitable to present tactics introduced. Naturally a large number of the old school opposed these views; but such must always be the case while men are so largely ruled by tradition and custom.

For these reasons, between 1866 and 1870 no real progress was made in either the training or fighting tactics of the infantry. Although at manœu-

vres the antiquated battalion formations were no longer conspicuous, in the barrack square they were very frequently used. Still in the minds of all thoughtful officers, and also in the instructions that were issued to senior officers, during this period, extended order had already been assigned its proper rôle.

Practical principles for the employment of artillery had been very quickly determined on. Dispersion was to be avoided; guns were to be kept together in masses, and were to be brought into action as early as possible.

Rules as to the employment of cavalry had also been formulated, which were proved to be sound in the next war.

It was determined to form independent divisions of cavalry, and at the same time also to allot cavalry to the infantry divisions. Though no attempt was made to improve either their regulations or training, the soundness of the principle of pushing them forward as far as possible to the front of the army, as strategic feelers, was recognized.

The chief characteristics of the German tactics in the Franco-German war were these: great masses of guns commenced the battle generally, overpowering the French artillery, the armament of which was antiquated, and which came into action in a disconnected fashion. The infantry contending against a superior weapon, advanced close to the enemy, when a protracted fire action ensued, in which the common barrack square practice of bringing up troops in close order into the firing line was proved impracticable. The final decision of the battle was generally brought about either by flanking operations of a greater or lesser extent, as at Wörth, Spicheren, Gravelotte, and Saint Privat, or by encircling the enemy, as at Sedan. Finally, in very few cases did the cavalry play a great part in the battle.

Scanning the details of the infantry fight, we notice that the last stage of the attack, the charge, was invariably in extended order. Another noteworthy point is that the Germans opened fire at short ranges, the French at long ranges. But when we investigate the effect of the French fire, we can come to no other conclusion than that the reason long-range fire never stopped the advance of the Germans was because it failed to inflict *demoralizing losses*.

This statement will at once raise a storm of contradiction, but on the whole it is true. Of course there were exceptions, but they have been made too much of, and were founded on two facts. First, there was the astonishment of the Germans at experiencing heavy losses at even 1000 metres when several great attacks were made over ground peculiarly suitable to long-range fire; secondly it was evident such attacks, particularly that of the Guards at Saint Privat, were made in unsuitable formations, and without sufficient artillery preparation. Besides, when was this attack of the Guards brought to a standstill? Not till within 400 metres of the enemy, a range which was a *close* one for the Chassepot.

This attack of the Guards is, however, always made the stock example of the terrific effect of long-range fire. The common assertion nowadays, that most of the battles of 1870-71 were fought at long ranges, can be contradicted by not one but very many cases in which men fought with the

greatest obstinacy for several hours, at not only very short ranges, but also without annihilating consequences on either side.

The fight of Saint Privat has served as the basis of a host of theories and consequent formations, and many of them show but a superficial grasp of the question.

A great but very common error is to generalize from the experiences of a *single* battle, and thence deduce lessons; but the only really valuable foundation for such lessons is the *average* of experience. War is so endless in its variety that we should be cautious against judging from isolated cases.

Another noticeable feature of the infantry tactics of 1870-71 was the almost entire disappearance of volleys, independent fire being generally employed. On rare occasions only was a volley in extended order successful, or when "mass fire" was used at night.

In the second phase of the war the Germans avoided the mistakes in the attack formation we have mentioned, without their offensive tactics suffering in the least.

The advance by rushes also dates from this campaign. It originated in the instinctive desire to close as quickly as possible with the enemy. The support of these rushes by fire action is generally very doubtful, though it is systematically practised on the drill-field. In battle it was only possible when favored by both ground and position of the firing line.

Such are the general outlines of the new modifications in tactics which the war of 1870-71 taught.

Extraordinary efforts were made in almost every army to forecast the fighting of the future, by utilizing the vast experiences of this great campaign. Here the Germans, naturally, as the most experienced and as victors, took the lead.

The changes made by the authorities in cavalry matters were at first entirely in consonance with the views advocated by the press. Improvements were introduced in elementary drill, in minor tactics, and also in the individual training of man and horse. Further, the great principle of pushing forward great cavalry masses, to act as a strategic reconnaissance, was recognized. It was also declared possible under certain conditions to make use of these masses on the battle-field; but, here, a few advocates of these ideas allowed themselves to be carried too far. The theoretical employment of the cavalry lines, frequently attempted at manœuvres, was impractical, particularly as regards the second line, and consequently was even then regarded with uneasiness by many tacticians. Finally these were not the tactics inculcated by Frederick.

Since the issue of the 1886 regulations new ideas have made great way. Returning to simplicity, the great demand is now for strength in the first line. The reformation which the German cavalry underwent from 1871-90 has now rendered it capable of any task, be it reconnaissance, the charge, or dismounted work. Certainly it might still be desirable not to push the reconnaissance at manœuvres to *minutiae* which would be impossible under fire, or in presence of a similarly thrown-forward screen of the enemy's cavalry. In the actual field you can never hope for the wealth of detail given in a peace manœuvre message.

A new gun was given to the artillery, which they still retain, though it has been, since its introduction, much improved. Hand-in-hand with these improvements came the double-walled shell, then the ring shell, and lastly the improved shrapnel. The doubt raised by outsiders in 1877 as to the efficacy of the last named projectile against artificial cover was at first rather sharply contradicted by gunners. They have, however, since admitted its truth. The Russians have now artillery regiments armed entirely with field mortars, and if these be light and mobile, they will probably be introduced into all armies for field service.

The instructions in the regulations of 1876 and 1889 show decided progress. Movements are simpler, quicker, and easier. Principles are laid down regarding fire, discipline, and the use of "mass-fire," which have their origin chiefly in the experiences of 1870.

The development of infantry tactics was neither so speedy nor so satisfactory as with either the cavalry or artillery. To a certain degree this was to be expected, as the phases of an attack by either of the sister arms are immeasurably simpler than those of the infantry. Modern tactics also demand more from the inferior leaders, and even the rank and file of the infantry, than from those of either of the other arms. The many and varying impressions of the battle, as the prolonged struggle continues, the patient endurance of the bullet-rain, the ebb and flow of the fight here or the terrific losses there, all make enormous demands on the coolness and nerve which a foot soldier requires in battle. To successfully command a large body of men under such circumstances is more than difficult. Exposed to all these horrors, the private soldier must not only retain the necessary discipline under fire, but also often be able to act independently. At the same time he must make every use of cover so long as it does not interfere with the full use of his rifle. He must be able to handle his complicated weapon with the accuracy it demands in sighting and aiming. Finally, if his ammunition becomes exhausted or a charge has to be made, he must know how to use the bayonet. Therefore with the development of extended-order tactics, despite all simplification of drill, the education and training of good infantry becomes a more and more difficult task. Above all things this education and training should aim at strengthening the man's *morale*. His position is the most dangerous and the most exposed in the battle. It is he who feels most acutely the miseries of the march. The regulations must redouble their efforts to lighten the work of both officers and non-commissioned officers.

Anything useless for the battle-field must be abandoned. Unfortunately the truth of all this was not realized quickly enough; despite many admirable proposals, people could never make up their minds where reform should first commence. This was partly on account of grave doubts as to whether discipline and steadiness would not be injured by too great changes, and also whether, taking into consideration the continuous improvement in fire-arms, the moment was yet ripe for a radical change. Finally, so great was the value placed on the regulations, which had stood us in good stead for three wars, that it was felt by many that their abolition could not be thought of. Certainly, in their time, these regulations had been excellent;

but by unduly postponing their alteration we stood the chance in the future of being overtaken and passed by some other power. What happened was this: Experiments were made of formations which were intended to lessen the effect of the enemy's fire; but many of them were, however, found so unpractical as to be speedily abandoned. After this partial changes were made, which, though effecting great improvements in both formations and training were inadequate. In many ways this system of patching was injurious. Being allowed greater independence and more absolute power than in any other army, many of our leaders began to make reforms on their own account. So long as they kept within the regulations this did little harm, but when tentative formations were substituted for those enjoined by regulations, when important portions of them were ignored, and when fundamental formations were intentionally allowed to fall into disuse, much harm was done.

These temporary weaknesses in our training were partly rectified by the promulgation of excellent orders for manœuvres, by the issue of instructions of exceptional value to the higher leaders, and by the great care universally bestowed on the field training of the soldier. Several editions of the Musketry Instructions were rapidly issued, in succession, to the infantry on its re-armament, first with the improved needle-gun and then with the Mauser. Unlike the Drill Regulations the Musketry Instructions changed their axioms frequently, particularly in target practice; this was a mistake. On the other hand, they continually improved in field firing, in which our men have now attained great excellence.

However these Musketry Instructions also contained instructions for fighting—an unwarrantable invasion of the province of the Drill Regulations. The instructions in question recommended the control of fire by the use of volleys in extended order, and also by naming a set number of rounds to be fired. On account of the greater range of the new rifles the use of long-range "mass-fire" was advocated in a very exaggerated and, till then, decried fashion. The infantry seized on and carried out these ideas to an absurd pitch. In many garrisons you heard of nothing but extended-order volleys and the use of ranges up to 1500 metres. The revolt against such ideas came, however, chiefly from the ranks of the infantry themselves, which showed their common sense. Finally recognizing the dangers of this long-range fire, to which we shall return later on, the authorities themselves took strong steps to check its abuse.

The endeavor to utilize to the utmost the advantages of a new rifle is most natural. However, experience shows such endeavors always result in the infantry forgetting the conditions of real warfare, settling an exaggerated value on the advantages of the weapon, and ascribing to it an undue influence in tactics, which has many other factors to take into account. With the eighties the infantry had come to the same conclusion as the present regulations, *i. e.*, to increase the old close ranges somewhat, but in the attack to avoid any great use of long-range fire, *i. e.*, from 1200-1700 metres. Here, though possessing rather antiquated tactics, the Germans showed themselves abreast of the times. Nevertheless the issue of new regulations could not be long postponed. Those of all other countries

were better adapted to the requirements of modern war. Preceded by an excellent field-service manual, and by again fresh musketry instructions, the new regulations appeared in September, 1888. It was quite time; instructions for the very rapidly issued magazine rifle had rendered them, if possible, even more necessary than before.

The main principles of the new regulations are in thorough accordance with the principles embodied in the orders of the Great Emperor, and which had also often been advocated by the press. The fight is to be governed by the firing line. Battle training can be best acquired by discarding all useless drill, and by a systematic instruction of the individual.

After the appearance of the new regulations some people thought that discussion on infantry tactics should terminate now we had all we could wish for. But nothing made by mortals is perfect, much less regulations, which, both in peace and in war, are tested daily by thousands of men. A practical trial is necessary to prove the value of anything; and, recognizing this truth in 1890, reports on the regulations were called for from the troops themselves. Great care had been bestowed in the preparation of the regulations, and they were the intellectual outcome of seventeen years' consideration. Seldom has any army been more unanimous in its approval of them than it was in this case.

Scarcely had they been issued than a new epoch in tactics dawned. Small-bores and repeaters had already been manufactured for some time, and a smokeless powder to be used with them had reached the testing stage. France led the way in these experiments, and Germany and Austria had perforce to follow. Through their small bore, sharper twist of rifling, and increased strength of powder, the new rifles have gained considerably in flatness of trajectory, range, penetration, and accuracy. The decrease in weight and size of the cartridge also allows of the soldier carrying more ammunition.

The superiority of such rifles over large-bore rifles, or even over the best single loaders, is, of course, not nearly so great as was that of the needle-gun over the muzzle-loader. Nevertheless, if an army is to be ready at all points for war, it cannot afford to have any but the best armament. It is scarcely likely our antagonists will repeat the mistake of 1866, and allow us an advantage in weapons. Since we can neither call the genius of invention to halt, and since we live in an age where thoughts are carried into execution with a hitherto inconceivable rapidity, it will be well not to prematurely believe ourselves approaching finality in armament.

Still more should we guard against rushing headlong into tactical novelties, or adopting with feverish haste each new invention on the strength of the results it claims. Such claims are only based on mere peace experiments, and have not, therefore, stood the test of war.

High explosives for the use of siege and fortress artillery preceded the introduction of the small-bore repeater. The penetration and effect of the new shell was so great as to necessitate generally a great strengthening of fortresses. This gave fresh force to the opinion that modern permanent works have lost much of their value. General Brialmont has lately contested this idea with some show of truth.

Following closely came improvements in the field artillery. These, having considerably raised the percentage of hits in range-practices, will probably, therefore, do so slightly on the battle-field. In the artillery, as in the infantry, the value of any improvement in the armament is always over-estimated at first, and for the past ten years the effect of artillery at manœuvres has been generally exaggerated. Of course, this assertion will be at once challenged. Mathematically, it is, we admit, incapable of proof, but on the other hand do the conditions on the range approach those on the battle-field? It is on war experience we base our assertion. Doubtless history shows inventions to have often had a great influence in the decisions of campaigns, as, for example, did iron ramrods at Mollwitz, and the needle-gun in 1866. Although in either case but one of many factors, let us assume that the result of these campaigns was mainly due to the superiority such inventions gave. Yes; but was that the true reason? The newest invention was used by one side only. Has any country such advantage in arms now? No; everywhere we find similar tactics, similar arms. The success of artillery will in future be decided by superiority in leadership and in the number of guns. It is claimed there is no infantry existing capable of facing the fire of modern artillery. Quite true, if the infantry be unsupported. Luckily, however, it never is unsupported. What justification is there for terming artillery pretensions "exaggerated"? The simple and oft-stated argument that in battle the artillery is under fire, and on the range it is not. The other side retorts, "An undeniable truism"; nevertheless this truism is again and again ignored in the prejudiced deductions made from range results.

The opposing batteries must inevitably engage each other. The losses in this artillery duel, both in men and material, will be much greater than formerly. The punishment, therefore, the guns of the defense can inflict on the advancing infantry will be infinitely less than is currently believed. Just as little will the attacking artillery be able to concentrate their entire strength on the defenders' infantry. The result of the artillery duel will, therefore, be the crippling to a greater or lesser extent of the guns on both sides. Should either, by better generalship or superiority of numbers, succeed in crushing the other, as in 1870 the German artillery crushed the French, then certainly it will be able to reap the full advantage of the new weapons. War is many-sided, and such occasions will always arise.

Neither should we forget that inequalities of ground cover, and the mobility of targets are constant factors against accuracy of fire. Also, though artillery will compel infantry to abandon manœuvre formations at greater distances than formerly, on the other hand good infantry, by adopting suitable formations, can easily advance across country though exposed to artillery fire.

As a matter of fact, the fire of the artillery cannot follow the advance of the infantry rushes sufficiently rapidly to inflict those shattering results we see at range practices.

Smokeless powder does not obscure the view, and therefore facilitates both *fire discipline* and correct aiming; on the other hand, since a well-marked artillery position will be difficult to see and to obtain the range of

accurately, it will be harder than ever to hit it. Smokeless powder has increased the defensive power of artillery against the attack of infantry and cavalry, as neither can any longer make a sudden attack under cover of the smoke.

Looking at the great rôle which intrenchments and cover of every kind must play in future wars, the introduction of a light field howitzer appears necessary. Such a weapon should be part of the field artillery, or should follow the army closely.

It can scarcely be disputed that smokeless powder has rendered the work of cavalry, in reconnaissance or in battle, even more difficult than before its invention.

As of yore, cavalry duties will, in future, consist in reconnaissance; in beating the hostile cavalry; in battle in self-sacrificing intervention at dangerous crises, and in obtaining local successes by lightning-like attacks by small bodies, and in disturbing the retreat of the enemy by masses. The increased range of guns and rifles will necessitate the position of the cavalry in battle being still further in rear than formerly. To insure their intervention at the desired moment, their horses must be trained to cover considerable distances at a high rate of speed.

And now let us turn to our main subject—the infantry.

The new regulations give brief directions how to work on a man's imagination. They are confined to a few simple principles for fighting, the inculcation of which is of primary importance and which is also calculated to sharpen his wits and raise his self-respect. Every pamphlet, every textbook enjoins the cultivation of the *morale* as absolutely necessary to success in an age where all nations are on a level as regards tactics and weapons. No one has yet been able to give a good recipe for the production of *morale*; and, indeed, to lay down hard and fast rules applicable to all times and circumstances would be impossible. Still, a few great principles must be plain to all. These are, that rules should be few and brief, as an attack must be made unswervingly and without hesitation; patriotism must be awakened by means of instruction; officers must give an irreproachable example, both in conduct and bearing, and they must raise the soldier's self-respect by treating him as an honorable man.

If these ideas be carried out so far as is compatible with rigid discipline, much will have been done to develop military virtues in the soldier, and to prepare him for the great tragedy of battle.

The soldier must be mentally and physically trained for war. *Ingrain* such training into him, and make it his second nature, even in the heat of battle, to keep touch with his officers and comrades. At the same time, cultivate the man's mental powers, and teach him to think for himself. War and the whistle of projectiles have a serious effect on the nerves of most men. So great is the instinct of self-preservation that some men completely lose their heads.

The soldier must pursue his calling in the face of death. Such is his *raison d'être*, often forgotten, particularly by the advocates of a militia and short service. Even we, the instructors of "the nation in arms," often forget this fact; most often, perhaps, during a long period of peace.

In the continual changes of armament, in the ever-increasing tactical development of the man, the instructor frequently loses sight of the paramount importance of *morale*.

(To be continued.)

SMOKELESS POWDER.

Précis from the French of CAPTAIN G. MOCH, French Artillery.*

BY CAPTAIN F. A. MAHAN, CORPS OF ENGINEERS, U. S. A.

CAVALRY.

EVERY improvement in fire-arms means a lessening of the part played by the cavalry. Repeating rifles leave small chances of success for a charge. Still, under cover of the thick smoke, bold cavalry might succeed in making a telling dash. But in a clear field a charge will have to be made throughout against invincible repeating fire. There will be few chances for success under such circumstances.

A recent author expresses a directly contrary opinion. His idea is that the smoke protected the foot soldier from the terror inspired by a charge. Whereas he will now see the cavalry mass bearing down on him and the intervening distance quickly growing less. It must be acknowledged that the moral effect of a charge will be increased a hundred fold. To be sure the leading squadrons will be swept away, but those coming after them will find the infantry with unloaded rifles, will trample it under foot, and then turn on the guns. The total loss will be heavy, 4000 out of 20,000, for example will fall to cavalry. It must be assumed that the destruction of several squadrons will prevent cavalry from coming up in good shape, and what must be the effect of this perspective of victories à la Pyrrhus? Now that cavalry is more than ever necessary between two actions, is it prudent or wise to sacrifice it on the field of battle?

Unless the country be very broken and unsuited to cavalry it is unlikely that this arm can be placed under cover at a fit point whence to make a charge. Hence, it will have to be left wholly off the field and reserved for the special duty of exploration, which will be amply sufficient to weary and decimate it.

It will always have to watch the wings of the field of battle and to keep the general commanding informed of what is going on. It should shun the temptation to charge the flanks of the enemy when profitless destruction will result,—at least until the end of the action. It will watch the chance of coming in decisively when our attack succeeds or that of the enemy fails. It will be on the lookout for the moment of pursuit and rush in headlong. No allusion is made here to brushes between our own cavalry on a reconnaissance and that of the enemy engaged on similar duty. An action of

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cavalry against cavalry is an affair of lance or sabre, which does not come within the scope of this work.

PARTISAN WARFARE.

This kind of warfare requires but a small number of men, acting unexpectedly and immediately disappearing, to obtain results frequently of the greatest importance. A powerful repeating arm, making neither noise nor smoke, will insure the success of most of the operations intended to harass and weary the enemy, such as attacks on outposts, supply depots or trains, seizing correspondence, descents on important points of the lines of communication.

THE HIGHER COMMAND.

Insufficiency of experience in times of peace.—Having considered the influence of the new powder on each of the three arms we must see what effect the diminution of smoke will have on the action of the commander-in-chief.

It is not proposed to take up methodically all the phases of the various kinds of action nor is it intended to point out the changes which may be made in the direction of the higher command. The desire is merely to call out reflections on the circumstances of the struggle which are not beyond reasoning, without forgetting that experience has always the last word.

If speculative reasoning inspires distrust, care must be taken against drawing absolute conclusions from the grand manœuvres, or at least these must first be submitted to a rigid discussion. Bullet and shell, the true sanction of every tactical rule, are there lacking. Smokeless powder imperiously demands this sanction if we are not to be led to imperfect knowledge or even to fall into dangerous errors. If the main advantage of progress is to facilitate fire and make it more accurate, does firing blank cartridges at troops or shell at guns served by motionless mannikins prove more in this respect than mere reasoning? How will it be known whether the importance of artillery is to be increased or whether smokeless powder will diminish the effect of artillery in the attack and lessen it in the defense?

The error of drawing conclusions from imperfect experience is evident. Glaring improbabilities are daily seen at the grand manœuvres. A troop of cavalry crosses a field under a steady fire of which, for lack of bursting shells, it does not know that it is the object. The judges cannot be everywhere at once, so the troop marches bravely on to the indignation of those who are destroying it in effigy. If such be the case there will in the future be no reason for thinking that one is in any but perfect safety at the most dangerous point of the field, because with the smokeless powder nothing will be seen or felt. The judges will be embarrassed for a decision and may even demand that the smoke be brought back for their information.

The object of what has been said is not to discredit the value of this sort of experience but simply to show that as great care must be used in interpreting their results as in theoretical discussions of the kind here undertaken.

Usefulness of smoke.—The commander-in-chief must be carefully distin-

guished from the commanders of small units. Smoke is rather useful than hurtful to him and, to a certain extent, the same is true of noise.

He is not in the midst of smoke as are the troops engaged in front of him. The more men engaged the further he must be from the firing line. In spite of the use of black powder the air around him is clear and the troops in action seem like lines of smoke. By marking positions on the ground smoke constantly indicates to the general the whole field; while without it he has at his disposal only incomplete and tardy reports. Now he can no longer hope to see more than a few hostile batteries. However little the ground be wooded or broken he loses sight of the skirmish lines, and it is in the broken parts of the field that the decisive moves will be made.

It is true that the smoke concealed the enemy's reserves and their movements. Little is gained, on the other side, because the first effect of the new powder is to cause them to be more carefully masked than ever. The general needs a view of the whole field, and that is just what the smoke gave him.

In a word, then, smoke is a great aid to the commander-in-chief. At the beginning of the action it outlines before him the enemy's positions and after that it materializes, as it were, the action before his eyes. By it he follows the movements of the opposing lines even in woods or very broken country and he is at once warned of new troops coming into action, of the success or check of an attack, or of the production of a panic.

Effect of detonations.—Distant cannonading.—If the general-in-chief is independent of the cloud of smoke which blinds the commander of a subdivision he also escapes the disadvantage of being deafened by the discharge of guns. The latter is a sort of roar for him of which he notices the characteristic and useful changes, such as the opening of fire by new troops on the line or its stoppage at a certain point indicating an attack or a retreat.

Hereafter no information of this kind can be expected from the infantry fire. While the artillery fire is somewhat deadened, its discharge may be likened to that from the old smooth-bores. But the reports will be more numerous as there are more guns, firing more rapidly. Moreover all projectiles burst now, and none of them noiselessly. It may then be granted that cannonading will be quite as noisy if not more so than that at the beginning of the century when it was heard at great distances.

There is no reason for thinking as some do that the commander-in-chief will not hear the artillery of his advanced guard. And more than once hereafter the fearful question will come up as to whether or not he should march to the noise of the guns.

Many mistakes have been caused by errors in interpreting sound. Distant cannonading may be mistaken for a storm; or some intervening obstacle, or the direction of the wind may prevent the sound from being heard. Two cases of this sort occurred at the battle of Forbach to a French and to a German division. After the battle of Dresden in 1813 the Emperor Alexander while retreating into Bohemia saw from the mountain of Geyersberg the smoke of the battle of Kulm; the wind prevented his hearing the guns and until exact information was received the smoke might have been taken for that of bivouacs.

If, in the future, discharges became weaker, while the disturbing forces remained as strong as before, similar errors may become more frequent.

To sum up: The noise of a distant action will probably not be seriously lessened. The commander-in-chief has now at his disposal a quantity of other means of information more worthy of confidence. The military telegraph will keep the different army corps in communication with the general, and, consequently, with each other; it will give them more certain and more detailed information than the noise of distant cannonades.

Hesitation at the beginning of the action.—It is a disadvantage inherent in large armies, with their great extent of front, that the commander-in-chief must rely on the eyes of others for many things which he could formerly see for himself. They do not see as he would in the same place, and the information given does not compare with what he would find.

While having more persons in reconnaissance, and also losing more, he will often be confused in giving his first orders when he meets the enemy. He may even hesitate in the midst of vague and contradictory reports and that too just at the time when a prompt decision is most needed.

Napoleon's saying "commence firing and then see" may be recalled here. In the future, unfortunately, we shall begin firing and then see little or nothing. Evidently we cannot deploy and go into action on a mere guess as to the enemy's position from the shape of the ground.

The cavalry's task is here very heavy. Fired on from no one knows where, it must still push ahead until it finds out something definite,—until it sees the troops. This may be quickly done with an enemy also on the march, but when the enemy keeps out of sight it will be very hard work to reconnoitre his position.

However bold and intelligent the men charged with reconnoitring may be, it can easily be foreseen that the preliminaries of an action will be greatly drawn out.

Offensive and defensive.—Hesitation and loss of life will be greatest before an opponent who has had some time in which to prepare his position. In a few hours he will have completely masked his troops, reconnoitred all the avenues of approach and arrayed posts of observation to give warning of attack. He will see without being seen. With a small part of his artillery he can check the head of the advancing columns which will have to deploy and accept battle under conditions of uncertainty demanding extreme caution.

Here the everlasting question of attack and defense, or at least one of its sides, must be considered in order to see to which of the two the new powder will give the greater assistance.

But what is the attack and what is the defense in the field? The terms must be clearly defined before intelligent discussion can take place. Strictly speaking there is no defensive in the field of battle. There may be very short periods of defensive struggle, but of defense, as in a siege, there is none. Of course a stand where there is no hope of winning, as, for example, to cover the retreat of the main body, does not come within the meaning of the term battle.

The defense will here be defined as the side which first sees the

enemy and seeks to receive his first shock in a position selected for the purpose while watching for a chance to take the offensive.

With this definition the defense gains by the use of smokeless powder. But does not the defense always gain by improvements in fire-arms? To attack one must march, to fire one must stand. Hence he who stops for a moment is the one most interested in having the best arms.

True the offensive does not consist simply in rushing upon the enemy. The preparation of the attack by fire may be so important as to decide the fate of the day. "When superiority of fire is obtained the offensive is clearly assured." If the attack has been well prepared it will generally suffice to show the enemy the bayonet, he will rarely wait to feel it. The *Militär Wochenblatt* says very justly: "What does to attack mean? It is to approach the enemy so as to obtain a decisive effect for our arms. That first gave the hand-to-hand fight, then the musketry action at short range, increased in later wars to 200 or 300 metres. In future wars decisive firing will take place at ranges of 300 to 400 metres or greater."

The attack now acts by fire as does the defense.

The assailant cannot disregard improvements in matériel. But in order to win he must come as close to the enemy as he can by taking advantage of all accidents of ground. But there are three things against him; he has not chosen the field; he cannot plant himself there beforehand; his movements betray him. Now, in order to obtain any good from smokeless powder, we must be seen as little as possible; otherwise it may do him who uses it more harm than good.

This is the generally received opinion. The *Militär Wochenblatt* says: "Hereafter the rule will be, in broken ground forward, in open ground halt. The forces will be correspondingly divided. If the conditions of the action force an attack in the open, darkness *must* be used for the advance. If that be impossible, there is nothing left but to manœuvre the enemy out of his position." These instructions, especially the last, are not easily applied.

We think that, without doubt, smokeless powder will greatly increase the chances of the defense as above defined.

If an army succeed in receiving the shock of the enemy on well-known and prepared ground from which it can see well, it can begin the artillery duel when it chooses and under conditions which will assure superiority of fire. Now, the success of the artillery struggle is at once the condition and measure of the success of the final offensive movement.

Development and end of the action.—The uncertain conditions in which the commander-in-chief begins the battle will continue throughout the action by reason of the disappearance of the smoke and the lessening of the noise of the musketry fire. From this German authors argue for an increase of the general staff; this conclusion being perfectly rational if the relative numerical weakness of the German staff be considered.

It has just been mentioned that during the entire action the commander-in-chief will have much trouble to get information. Troops, to be sure, cannot be hidden until the action is over but must show themselves at last. Now they may be visible to those immediately in front while they escape the sight of the general.

Moreover whenever either side dares to take the offensive openly the action will be well under way, it will be too late for new combinations and there will scarcely be time to bring up the nearest reserves and double the intensity of the fire.

At no time during the action can the general trust much to his own eyes. His orders will depend much on the value of his staff officers and the chances of these latter escaping the dangers which accompany the accomplishment of their errands.

Captive balloons have been counted on for assistance. But they cannot do much. They can only be sent up at a safe distance, say 5000 metres, from the enemy's artillery, and even then the time during which they are up must be short.

As to hidden troops a great many can escape the sight of a balloon. If we look from a height of 300 metres at an object 5000 metres away the line of sight follows a slope of $1/17$ very nearly and quite large dead angles exist.

Nor can much assistance be expected from small details of equipment. A writer in the *Militär Wochenblatt* suggests that the higher staffs be supplied with spy-glasses magnifying 24 diameters. He recommends that they have a screw attached whereby they can be fastened to a tree. Another writer in the same journal says of these glasses that "in order to believe in their usefulness one must never have handled one."

Under these circumstances, it is easy to see how great are a general's difficulties in handling men who are not on the firing line, in other words, men who are concealed. Unless in a very broken country how is he to know, for example, whether a given point where he wishes to mass his reserves will not immediately draw the fire of a battery from a site where nothing showed the enemy's presence? There will be needed great care and long détours to concentrate reserves for attack, for a flank movement, or to repel an assault.

It appears then that the general-in-chief must be constantly struggling against that greatest of dangers, uncertainty. His masterly qualities, rightness of judgment, promptness of decision, energy of execution, will, on account of this uncertainty, be of ten-fold value.

Which of the two chiefs will dare to take the initiative of attack? Bravery is a fine thing but the commander of a small unit alone has the right to push it to madness when there is a great end to be gained. The commander of great masses must know that he can only assume the responsibility of attack when he is sure of success. If he feel he cannot thereafter make a second trial; his troops are "done for."

Still an end must be made. We cannot remain indefinitely on the ground firing at an invisible enemy. The *Militär Wochenblatt* says:

"The more difficult it will be for the chief to keep posted on the movement of the action the more independence he must give to his subordinates. This will be the more necessary in the future because once the infantry is engaged, the decision of the battle will be *very soon*, and the signal for attack will start *almost always* from the skirmish line. Hence it is essential that the subordinate chiefs be alert, well prepared and capable of acting in

the spirit of the commander-in-chief, even without receiving any orders *during* the action. In the second place the bodies in the rear must *from the beginning of the affair* be pushed as far as possible toward the first line, a condition which demands a covered field."

It may happen that the artillery struggle will be short. It is quite enough that a few groups of batteries on one side get the range quickly to have the advantage thus obtained spread from one to the next and so crush the enemy's artillery in short order. In this case the latter's infantry will not succeed even in deploying but will have to retreat at once under the protection and through the sacrifice of the remaining batteries.

But, in general, the artillery struggle will be sufficiently prolonged to let the infantry deploy and advance within good musket range of the enemy, say 500 to 600 metres.

At this stage the fight may drag for some time unless the result of the artillery duel be clearly foreshadowed, in which case the final decision will follow close. The preparation for the attack will not be long. The victorious artillery by concentrating its strength on the infantry will soon crush the point of the line where the breach is to be made. At the distance from the enemy to which the infantry has been pushed, it will be able to judge of the effects of the artillery fire; hence it is very likely that the final spurt will start from the skirmish line. It has also been seen, speaking of the infantry fight, that the absence of smoke can only facilitate the general rush of the line and the connection of various smaller units.

The evident result of the later campaigns, by extending the field of action of the commander-in-chief, has been to increase the importance and initiative of the chiefs of the tactical units. Smokeless powder, which makes their command easier, while interfering with that of the chief, must make this change more marked. As has been said of certain actions in past wars the next battles will be essentially battles of captains.

As there will be little time between the end of the artillery duel and the attack, so but little will be needed to have the latter end in a decision. Whether the attack succeed or fail, whoever starts to run will scarcely avoid a terrible disaster. To be convinced of this one has only to consider the case of troops retreating before, sharp, accurate, smokeless fire. Undoubtedly the pursuer will sometimes experience disagreeable surprises from troops placed beforehand at well-chosen supporting points, but the losses thus encountered will be as nothing to those inflicted on the troops who have just evacuated the first line. The latter will very soon see their retreat change into a complete rout into which the rest of the army will be inevitably dragged. The small forces placed at supporting points will not suffice to stop and reform those who flee.

THE DUAL NATURE OF COAST AND HARBOR DEFENSE.

BY A STAFF OFFICER (BRITISH).

(The United Service Magazine, London.)

ATTENTION is from time to time directed to the question of Imperial Defense, and a special impulse was not long ago given to its consideration by a lecture delivered at the United Service Institution by Sir William Jervois.*

What is most remarkable about this lecture is the sweeping nature of its proposals, and the fact that while they proceed from a soldier they would, if carried out, practically result in denying to the army any share in the defense of the Empire until an invasion in force was an accomplished fact, and the invader's troops stood within measurable distance of the capital.

For Sir William Jervois' main contention is that all coast and harbor defense should be entirely naval, and in naval hands, and that the army should not be allowed within sight of the sea, that element the presence of which is apparently held to have so paralyzing an effect upon our land forces as to render their efforts valueless. The effect of Sir William Jervois' extraordinary proposals would, in fact, be to cause each of our existing lines of defense, naval and military, to take a "pace to the rear;" for, while driving the army inland, he would force the navy from the open sea to defend the coast line.

Would it not be wiser to wait for this restriction upon the movements of both services until the fortune—or misfortune—of war brings it about, and would it not be foolish, at the bidding of a school of faddists, to take so retrograde a step, and one, moreover, opposed to the teachings alike of nature and of common sense? The chief reason Sir William Jervois gives for this upheaval of our past and present arrangements is that as the harbors chiefly exist for the use of the navy they should be defended by it. But his proposal, if carried out, would cause the navy to exist for the protection of the harbors, not the harbors for the protection and assistance of the navy, and by thus charging this service with the entire responsibility of guarding its bases, he would practically restrict its field of action, and very considerably reduce its powers of offense.

But, leaving this consideration out of the question, it does not the least follow that because the harbors are for the use of the navy they must therefore be entirely protected by that service. It would be more logical if it were urged that because naval defense is far more important to a harbor than land defense, therefore the sea service, and not the land service, should entirely furnish it, but this Sir William Jervois does not say, probably because he cannot. The fact that harbors are chiefly of value as naval bases

*Sir William Jervois' article appeared in the *Journal of the Royal United Service Institution* for August, 1897.

does not imply that they require nothing but naval defense. As well might it be said that a military force across the seas supplied from home with men, material, and equipment must have its supplies and its line of communications in military hands, and that soldiers, and not sailors, should therefore take charge of the ships and fleets supplying it. Or, again, it might be urged that a cavalry force operating from a fortress base must have that base in cavalry hands, and that artillery, engineers, and infantry must have no part in its defense.

Such assertions would be childish, and, what is worse, destructive to the army in the field.

In this case the army in the field is represented by the navy on the open sea, and to say that because it is a naval force its base must be entirely guarded by the navy is so entirely inconsequent an assertion that it is to be wondered so clever a man can have put it forward.

The proper way to consider this matter is not to ask ourselves what uses the harbors or the coast serve, but to what attacks they are liable, and how best such attacks can be met. This question is not one of the interests of the navy or the army, but of the nation, and to pit one service against the other as Sir William Jervois has succeeded, or nearly succeeded, in doing, is a proceeding scarcely worthy of so distinguished a soldier.

The safety of the Empire, and the good of the service—not of any one service, naval or military, but of the Imperial Service, in which both are joined—is what we should seek.

How is this best attained?

By placing the whole defense of our coasts, by land and sea, in one hand, and by either giving to the army all coast ships as well as all coast forts, or to the navy all land defenses as well as all floating protections? No; but by employing each service in its proper sphere; by assigning to sailors the floating or sea defense, to soldiers the stationary or land defense.

If the two services are so opposed that they cannot act together for the national protection; if English sailors and soldiers have so little in common that they cannot coöperate in the supreme task of the defense of their common shores, then the British Empire is indeed in a bad way, and all the schemes enunciated at the United Service Institution or elsewhere are powerless to save it.

But, as a matter of fact, this is not so, and navy and army work together to-day as well as ever, and whether they are engaged in despatching expeditions to distant and hostile countries, or are less arduously concerned in the protection of our home coast line against imaginary foes, they work, as they have always done, thoroughly in accord.

As an officer who has had considerable experience of, and insight into, some recent joint naval and military expeditions, and who has been intimately concerned with the defense of one of our most important coast sections, the writer is not speaking at random, but from experience and observation gained at home and abroad.

One of the favorite arguments against our present and long-established system is that the other Great Powers follow a different plan, and as a rule place their coast defense by land and sea entirely in naval hands.

In comparing ourselves with other Powers, as we are so fond of doing, we seem to forget our very different situation. The chief point of difference between us and other nations lies in our insular position, and if this is sufficient to cause us to differ from them in respect of conscription, short military service of two or three years, and such matters, it still more powerfully and directly affects the question of our Coast Defense. All the Great Powers of Europe place their army first, and look upon their navy as a second or subsidiary defense. We, on the other hand, regard, and justly, our navy as our first, our army as our second line. The great military Powers, moreover, have most to fear on their land frontiers, and to concentrate there in the shortest possible time the largest possible number of men is their great endeavor.

Their coast line is a secondary consideration, and to their navy, their second line of defense, they confide the protection of the coast, because by so doing they are enabled to mass a larger army on their land fronts, and every sailor or marine in a coast fortress means a soldier the more in the field. Their army is, moreover, by no means a purely defensive force; it is on the contrary a mighty engine of offense, and were it possible to protect its base by naval means we may be sure each Great Power would do so in order to send into the field a larger force for offensive work.

Our condition is the exact opposite to this. We are first a naval, then a military power. We have no dangerous land frontier subject to invasion at a few hours' notice, but we possess a sea line which forms our greatest strength. How best can we protect it? By lining it with ships afraid to leave it for fear of losing their base of operations? Certainly not. A fleet to be effective must, like an army in the field, be able to move freely in the theatre of war, having its base and communications secured. How best can it have a secure base and great offensive power? Not by confining its efforts to the protection of that base, but by issuing boldly forth, and meeting the navies of other Powers with an overpowering strength; not by frittering its strength along a most extended coast line, but by uniting to crush upon the high seas the weaker opposition of a less naval nation.

Yet that coast line and those harbors must have defense. Where can they get it? Why in the secondary service, the army, which plays for us in this respect the part the navy plays for Germany or France. But there is yet another reason why we are sound in our arrangements for coast defense—sounder than either of those two nations for instance. The defense of a harbor or coast line must partake of two elements, and is found partly on land, partly at sea. The very word "coast" implies land as much as it does sea, and for its defense we must have land as well as sea armaments.

Among the former we reckon fortifications, guns, torpedoes, or mines fired from shore, and all the many details connected with these armaments, such as range and position finders, electric lights, etc. Among the latter are coast defense vessels, gun and torpedo boats, and torpedoes and mines fired at sea. The general defense, then, consists of two separate and distinct parts: to bind both over to one service, and either make the soldier fight on sea or the sailor on land—unless some very strong reason exists for

doing so—would be to confide one-half of the defense to men who are out of their element, and are not engaged in work they have been trained to perform.

So arbitrary a proceeding does not seem to be the true solution really arrived at by us many years ago, and which consists in confiding sea defense to sea troops, land defense to land troops. To place bluejackets in a fort, manning guns, serving magazines, manipulating range finders, telephones, submarine mines, electric lights, range dials, etc., would be deliberate waste of material. At present these duties are very properly performed by landsmen, and where specialists are required, specialists are employed under the direction of military, not naval, specialist officers. Would Sir William Jervis confide these duties to sailors, and send, for instance, into underground magazines and laboratories men whose training has led them aloft rather than below? Would he employ them to construct, preserve, and defend the ditches and parapets of a complicated fortress?

Again, take such places as Portsmouth, Plymouth, or Dover. They are fortresses having as extended a range over land as over sea, although both land fronts and sea fronts may exist for the protection of a harbor or a section of coast. The land fronts are not to oppose a naval, but a military attack. They will not be threatened from the sea, with which they have no concern, but can only be assailed by a land force. Such a force would be a military one, armed, perhaps, with siege guns, commanded by a general officer, and formed of soldiers, not sailors.

Yet Sir William Jervis would oppose to this military force, composed of the picked soldiers of a Continental army fighting on their natural element, land, a naval force commanded by an admiral who, admirable as he might be on the sea, would scarcely be likely to shine to advantage in conducting a land defense.

It may be said that all forts bearing upon land defense would still be in military hands; but, if so, we should have two forces, one naval, the other military, engaged in the defense of one continuous circle of forts, and the distinction would not be drawn, as now, between defenses on land and defenses on sea, but between similar and adjacent land defenses, having different objectives. If there is likely to be confusion now what would there be then?

There is yet another view to be taken of this subversive scheme, and one quite as unfavorable to it as those already mentioned. If all shore defenses are to be in naval hands, either their garrisons must be periodically taken away to go to sea, and thus be at home on neither element, or there must be formed a coast or fortress defense corps, whose sole duties would be the defense of such fortresses. This latter alternative would be a bad one.

There is nothing so monotonous as life in a fortress; no duties so uneventful, no career so devoid of promise, as those entirely concerned with garrison work. Troops continuously employed in such work—call them soldiers or sailors as you will—would soon deteriorate; commissions in such corps would soon cease to be sought after; and as year after year passed with fresh opportunities of distinction occurring for the troops of the field army, but with none for those of the coast defense corps, the officers and

men of the latter would lose the incentive that constant and varied employment and ever present ambition so readily confer. If we need an example of this we have but to turn to the garrison artillery. This branch of the royal artillery is undoubtedly less popular than the other two, and but lately measures have been taken, and a considerable sum has been voted to render it more attractive. Yet in it officers can be, and are, constantly transferred to the more seductive branches of horse and field artillery, while there is nothing to prevent non-commissioned officers and men from such transfer.

It is urged by many persons that the garrison artillery should be entirely separated from the mounted branches of that regiment, and, without entering into the merits of that much-debated question, it may be pointed out that one of the greatest defects that such a separation would cause would be the degeneration of the less attractive branch. Some of the smartest, most zealous, and best officers in the garrison artillery are those who have lately come from, and who possibly hope some day to rejoin, the mounted branches. They import life and varied experience into an otherwise monotonous service, and, accustomed to mix in the field both in peace and war with other troops, they prevent the garrison artillery from degenerating to a dull and monotonous, if scientific, level. Yet, as already mentioned, the garrison artillery is not a popular service. But imagine the whole coast defense intrusted to a force whose duties would be quite as monotonous as those of the garrison artillery of to-day, but without even the opportunities that now exist in that branch for change of work and scene, and we may imagine the unpopularity and stagnation that would soon result in such a force.

Sir William Jervois seems to imagine that there exist now in the army two distinct and separate forces—the field army and the garrison army. Such a distinction exists only on paper.

For purposes of mobilization for home defense the regular and volunteer army has been thus divided, but the units of the regular army assigned to the two forces change from day to day. Thus an infantry battalion quartered to-day at Plymouth, let us say, would belong to the garrison army, but moving to-morrow to Aldershot, would be transferred to the field army. No unit of the regular army at the present moment has any special or permanent garrison or field duties to perform, or is permanently assigned to either force. If, however, a coast defense corps were formed whose perpetual duties would be to garrison our coast fortresses, this varied experience of soldiering, not only all over England but throughout the world, would disappear; and once in that force, always in it would be the rule.

The bugbear of which Sir William Jervois seems most afraid is that there will be a want of coöperation between the superior officers of both services. We confess we do not share this alarm. Nor do we think, after practical experience, that the two services touch one another so closely in defense as is imagined.

After all, the defense at sea is very distinct from the defense on land although the object of both is the same. An enemy's fleet advancing against the mouth of the Thames, for instance, or a vessel attacking Dover harbor,

would encounter both naval and military resistance. Such resistance would have one common object, the destruction of the attacking vessels or vessel ; but the means of accomplishing such destruction—somewhat similar as they may seem—are not so interdependent as to require that unanimity of command and direction Sir William Jervois would have us to believe is so necessary, but under our present system so wanting. A general agreement between the naval and military commanders as to the main lines of action under certain conditions is all that is required, and such an understanding is easily arrived at.

Certain details no doubt require attention, such as a common code of signals, and the means of rapidly conveying information as to hostile vessels from navy to army ; but these are details that should not be beyond our powers of organization to arrange, and that certainly do not justify us in completely upsetting our present system of defense.

What is chiefly required is an understanding that both the navy and army exist for the common defense of the Empire ; that each has a separate sphere of action ; and that where these spheres touch, a little arrangement is necessary to ensure successful coöperation.

When such arrangement has been made practice in the playing of the individual parts is wanted, not only practice of each separate part, but combined practice, in which both services take part.

That this is becoming gradually recognized is evident from the increasing number of combined naval and military manœuvres, some on a large, some on a small scale, that are now annually taking place.

By organization and arrangement, therefore, rather than by wild and startling upheavals of a long-established and successfully tried policy, should we seek to improve the defense of the Empire, and we should remember that our best defense lies in the cordial agreement and understanding that has always existed—and, let us hope always will exist—between two services whose share of the common defense should be equal, as their pride in it is equal ; and whose mutual understanding is fortunately sufficiently strong to withstand any attempt to turn one against the other.

CANET v. KRUPP GUNS.

(From *Engineering*, London.)

SO long ago as 1889 it was widely recognized that a rival to Armstrong and Krupp had arisen in France, and that the Forges et Chantiers de la Méditerranée, who, some years before, had established a gun factory at Havre, were beginning to compete with the older and famous firms for the supply of artillery to foreign nations. The spirit of conservatism that ruled over the English and German works has prevented much detailed information from becoming public as to the guns made there; the Forges et Chantiers, however, have considered it good policy to publish—through our columns—the fullest particulars of every type of ordnance they produce, being well aware that such publication would only redound to the honor of France and their own credit, and could in no way afford information that could be hostile to either.

In the course of the articles published by us on the Canet system of artillery, we from time to time made some general comparisons between that and the Krupp system. The materials for detailed comparison were then not available, but recently a minute comparison has been made and published in the *Internationale Revue über die gesammten Armen und Flotten*. Coming from a German writer it was of course both natural and fitting that all points in favor of Krupp should be fully insisted on, and it is our present purpose to summarize without any comment the comparison referred to, leaving to M. Canet the privilege of replying should he think fit.

The investigation deals with two calibres of very similar value, the 32-centimetre Canet and the 30.5 calibre Krupp. Some particulars of these guns are as follows:

TABLE I.—PARTICULARS OF 12-6-IN. AND 12-IN. CANET AND KRUPP GUNS.

	CANET.		KRUPP.	
	cent.	in.	cent.	in.
Calibre.....	32	12.6	30.5	12
Length in calibres.....	40		35	
Weight of Gun.....	kilos.	tons.	kilos.	tons.
	66,000	66	62,450	62.45
" projectile.....		lb.		lb.
	455	1003	455	1003

The weight of gun given above is not that with which the results recorded in Table II. were obtained, but is intended for firing larger charges. The gun used in the trials weighed only 48 tons, or nearly 18 tons less than the Canet gun.

The three rounds fired from the Krupp gun would, if they had been fired from the normal type, have been 524.5, 579.9, and 723 foot-pounds of

TABLE II.—SHOWING RESULTS OF FIRING WITH THE CANET 12.6-IN. AND THE KRUPP 12-IN.GUN.

CHARGE.		PROJECTILE.			ENERGY OF PROJECTILE AT MUZZLE OF GUN.														
Gun.	Nature of Powder.	Weight.		Initial Velocity.	Total P ²		Per Cent. difference of Circumference of Projectile.		Cross Section of Projectile Per	Weight of Projectile per		Weight of Gun per	Gas Pressures.	Penetrating Power of Projectile in Wrought Iron Plate.					
		Kilos.	lb.		m.-tons	ft.-tons	m.-tons	ft.-tons		sq. cent.	sq. in.				kilo.	lb. foot-tons			
				m. ft.									atm.	tons per sq. in.	in.				
1 Canet..	P. B. S., sample 3, 1890	179.9	396.6	987.7	575 1885	7349.5	24.385	75.10	615.8	9.39	195.59	42.01	62.54	114.39	374.5	1370	9.9	83.5	32.88
2 Krupp	P. P. C. /82 D. X. 89...	180	398.8	1003	580 1920	7801	25.190	81.42	667.64	10.68	222.46	43.34	63.485	124.9	408.7	2370	15.55	90.7	35.77
3 Canet..	P. B. S., sample 3, 1890	199.3	439.5	987.7	613 2001	8380.5	27.710	85.35	699.87	10.67	222.25	43.05	63.087	130.0	416	2020	13.25	92.2	36.30
4 Krupp	P. P. C. 82 D III. 91...	200	441	1000.3	610 2000	8659	28.865	90.06	738.49	11.81	246	43.15	63.707	138.2	453	2665	17.48	97.9	38.54
5 Canet..	B. N.,	110	242.5	995	553 1515	6566.3	22.495	69.33	568.51	8.66	180.39	63.33	92.767	105.55	346	1153	7.95	79.2	31.18
6 Krupp	W. P. C. 89 D. X. 90...	103	227	1003	681 2234	10,755	34.733	112.27	924.61	14.72	365.62	104.4	152.912	172.2	564	2640	17.22	116.0	45.6
7 Canet..	P. B. S.,	255	569	987.8	704 2310	11,399	36.580	112.7	924.1	14.09	293.49	44.43	65.08	171.7	563.2	2545	16.56	114.8	44.9
8 "	B. N.,	135	297	995	702 2294	11,341	36.620	112.81	925	14.10	293.70	84.01	123.155	171.8	563.5	2174	14.06	114.2	44.9
9 "	"	138	304	987.8	697 2287	11,105	35.860	110.47	905.85	13.81	287.65	80.47	117.593	168.19	551.5	1931	12.67	119.4	44.2

energy per pound weight of gun. It is to be regretted that the trials were not made with the normal type, as the deduction leaves room for controversy. The data given in the tables of velocities, pressures, etc., of the Canet gun were taken from the *Revue d'Artillerie* vol. xxxviii., page 70. Two of the results from the Krupp gun were taken from the official firing report lxxxvi, and the round fired with a powder charge of 441 lb. is from an experiment made after the report was published.

In the firing test of the Canet 66-ton gun, before the Japanese Commissioners, twenty rounds were fired; in thirteen of these, brown powder (mark P. B1, S.) was used; in six rounds mark B1, N. powder, and in one, mark B. N., sample 6,1890. From these rounds three were selected for comparison which closely agreed, as to weight of projectile and charge, with those of the Krupp gun. The last Krupp round recorded in the Table, with a charge of 227 lb. of powder (mark W.P.C., 1889), is compared with the rounds from the Canet gun giving the highest efficiency, and special reference is made in the article under consideration to the phenomena attending these rounds.

The points deduced from the Table are as follows:

A.—ROUNDS FIRED WITH BROWN POWDER.

1. The Canet 987.7 lb. (448 kilos.) projectile had velocities respectively of 1885 ft. per second (575 m.) and 2010 ft. (613 m.), with charges of 396.6 lb. and 439.5 lb. of P.B1, S. brown powder, and with gas pressures of 9.9 and 13.25 tons per square inch. The Krupp projectile, weighing 1003 lb., recorded velocities of 1902 ft. and 2000 ft. per second (580 m. and 610 m.) with charges of 396.6 lb. and 441 lb. of P.P.C./82 powder, the pressures recorded being 15.55 tons and 17.48 tons per square inch.

2. The total and relative strains on the Krupp gun are not greater than the Canet, but the powers of penetrating a wrought-iron plate with the former are 35.71 in. and 38.54 in. and in the latter 32.88 in. and 36.30 in.

B.—ROUNDS FIRED WITH B. N₁, AND W. P. C. /89 POWDERS.

1. With a charge of B. N₁, powder of 242.5 lb. a velocity of 1845 foot-seconds was obtained with a Canet projectile of 995 lb.; while the Krupp gun with a charge of 227 lb. of W. P. C. /89 powder imparted a velocity to the projectile of 1003 lb., of 2234 foot-seconds. The total and relative energies are greater in the case of the Krupp projectile, and its penetrating power is also higher, being 45.6 in. of wrought iron at the muzzle, while that of Canet is only 31.18 in. In comparing the efficiency of the Krupp gun with the three best recorded rounds of Canet, it is noticed that notwithstanding the higher initial velocity and total energy of the Canet projectile, the energy of the Krupp projectile is greater per square inch of projectile section, per pound of powder charge, and per pound weight of gun, and the deduction is drawn that the Krupp gun is superior as regards average energy of projectile and efficiency of gun. The Canet gun is capable of piercing 44.9 in. of wrought iron at the muzzle, and the energy per pound weight of the weapon is 563.5 foot-pounds. The Krupp gun, on the other hand, can pierce 45.6 in. at the muzzle, whilst the energy per pound of gun is 564 foot-pounds, and this superiority is the more noteworthy in that the Krupp gun is at the same time shorter and of less calibre.

Referring more particularly to round No. 7, in which the Canet gun was fired with 562 lb. of P. B₁. S. powder, the report states: "Après chaque coup, la culasse était ouverte par un seul homme, sauf après le 18^e coup (No. 7 of our Table), ou l'on a dû mettre deux hommes à la manivelle." This remark leaves it to be inferred that the charge of 562 lb. of P. B₁. S. powder rendered the loading troublesome, but no information is given as to the time required for this operation. As no further shots were fired on that occasion it seems fair to assume that the gun would be incapable of standing a succession of shots with such high charges without more serious trouble ensuing. This difficulty with the breech is the less excusable in that the maximum pressure in the chamber was only 16.69 tons per square inch, an amount which experience proves the Krupp guns are capable of withstanding indefinitely without injury to either the breech-block or its mechanism.

Taking now the two rounds Nos. 8 and 9 of our Table, in which the Canet gun was fired with charges of 297 lb. and 304 lb. of B. N₁. powder, it will be noted that the results show a great want of uniformity. Although the shell was lighter, and the charge heavier in No. 9 than in No. 8, the muzzle velocity, instead of being greater, is actually less than it was in the preceding shot. The report merely remarks, "Au 16^e (No. 9 of our Table) coup le chargement avait été fait dans de mauvaises conditions et la combustion de la poudre a été incomplète, ce qui explique la faiblesse relative de la pression et de la vitesse." Nothing is said, however, as to the nature of the unfavorable conditions, or of the cause of the incomplete combustion of the powder. Such defects as those pointed out give rise to the opinion that the safe working limit of the gun had been exceeded, and that, therefore, no practical value is to be attached to the results obtained.

Let us now compare results obtained with a 5.9-in. quick-firing Canet gun of 48 calibres long with those obtained with a 5.9-in. Krupp gun 40 calibres long. Particulars of the guns and tests are given below:

TABLE III.—PARTICULARS OF CANET AND KRUPP 5.9-IN. QUICK-FIRING GUNS.

	Canet.		Krupp.	
	mm.	in.	mm.	in.
Calibre.....	150	5.9	149.1	5.864
Length in Calibres.....	48		40	
Weight of gun.....	kg.	tons.	kg.	tons.
	6400	6.31	5650	5.57
" carriage.....	4700	4.64	4450	4.390
Maximum recoil...	mm.	in.	mm.	in.
	550	21.66	450	17.72
Weight of projectile.....	kg.	lb.	kg.	lb.
	40	88.2	40 and 51	88.2 and 1127

The data as to the dimensions and weight of the Canet gun are taken

TABLE IV.—BALLISTIC DATA OF 5.9-IN. CANET AND KRUPP GUNS.

Gun.	Nature of Powder.	Weight of Charge.		Weight of Projectile.		ENERGY OF PROJECTILE AT MUZZLE OF GUN.										Maximum Pressure.	Penetration in Wrought Iron.		
		kilos.	lb.	kilos.	lb.	Total.		Per Centi- metre and per inch of Cir- cumference of Projectile.		Per Centi- metre and per square inch of cross-section of projectile.		Per Kilo- gramme and per Pound of Weight of Gun.		atm.	tons per sq. in.				
						m.-tons	ft.-tons	m.-tons	ft.-tons	m.-tons	ft.-tons	kilos.	ft.-lb.						
Canet.....	B.N.....	13	28.7	40	88.2	728 ¹ / ₂	1080.5	3400	22.93	188.03	6.11	127.27	83.1	121.72	168.8	553.5	2092	46.6	18.39
Krupp.....	W. P. C./B ₉ (15/7.5) { IX, 90	13	28.7	40	88.2	818	1084	4405	29.12	238.78	7.81	162.68	104.9	153.68	241.4	791.3	1045+73	57.33+40	56.0
Canet.....	B.N.....	15	33.0	40	88.2	824 ¹ / ₂	1384.3	4407	29.37	240.9	7.83	163.1	92.3	135.20	216.3	709.3	2810	18.43	22.09
Krupp.....	W. P. C./B ₉ (15/7.5) { IX, 90	13.3	29.3	40	88.2	833	1415	4570	30.20	247.66	8.10	169.77	106.4	155.84	250.4	821.3	1775+55	17.87+36	57.5

* These are initial velocities as calculated from the velocities at 65 m. The "Revue d'Artillerie" quotes these initial velocities as 740 m. and 898 m. respectively, or 18 and 14 metres too high.

TABLE VI.—BALLISTIC DATA OF CANET AND KRUPP 4.72-IN. SIEGE GUNS.

Gun.	Nature of Powder.	Weight of Charge.		Weight of Projectile.		Muzzle Velocity.		ENERGY OF PROJECTILES AT MUZZLE OF GUN.						Maximum Pressure.				
		kg.	lb.	kg.	lb.	m.-tns.	ft.	Total.		Per Centi- metre and per Square Inch of Cross-Section of Projectile.		Per Kilo- gramme and per Pound of Weight of Gun.						
								m.-tn.	ft.-tns	m.-tn.	ft.-tns	m.-tn.	ft.-tns		m.-tn.	ft.-lb.		
Canet.	C ₃ brown.....	4.6	10.1	18 to 19.2	39.7 to 42.3	514	1087	972.4	6.43	52.73	2.14	44.55	52.7	77.2	169.5	556	2110	13.84
Krupp.	P.P.C./Ba H X. 89.....	5.0	11.0	20	44.1	500	1640	254.8	7.73	6.76	55.43	2.25	46.86	50.97	74.68	178.8	585.5	14.17
Canet.	B.N., sample 155, 1889...	3.95	7.2	18 to 19.2	39.7 to 42.3	577	1893	305.4	9.86.5	8.10	66.42	2.70	56.24	93.9	137.58	213.6	700.6	11.860
Krupp.	W.P.C./Ba (6/3) IX. 90.	2.44	5.3	20	44.1	592	1943	357.3	115.4	9.48	77.73	3.16	65.83	146.4	214.53	251.6	825.3	10.23
																		15.52

from the *Revue d'Artillerie* vol. xxxv., page 86, whilst the firing data are an extract from a report on nine shots fired at the Sevrans-Livry proving grounds in March, 1890, published in the thirty-sixth volume of the same journal, page 85. Referring to the table of dimensions, it will be seen that the Canet gun was nearly $\frac{1}{4}$ ton heavier than the Krupp gun, and its carriage is also $\frac{1}{4}$ ton heavier, so that taking the guns as mounted the Krupp is the lighter by a full ton.

For the purpose of comparison two shots have been selected from those fired by each gun. The first pair of results were obtained under very similar conditions. The powder charge in each case weighed 28.7 lb. and the projectile 88.2 lb., but whilst the Canet gun gave a velocity of 2389 ft. per second, with a pressure of 13.71 tons in the chamber, the Krupp gun gave a velocity of 2684 ft. per second, with a pressure of $17.33 \pm .49$ tons.

With 33 lb. of powder the Canet gun gave its maximum velocity of 2703 ft. per second, the pressure being 18.43 tons. This result was exceeded by the Krupp gun with a charge of but 29.3 lb. of powder the pressure being $17.87 \pm .36$ tons, and the velocity 2733 ft. per second. The work stored in the Krupp projectile, whether taken as a whole or referred to the several units as in Table IV., is greater in both examples. At the muzzle the Canet gun would be capable of piercing a wrought iron plate 18.39 in. thick in the one case and 22.09 in. thick in the other, whilst under the same conditions the Krupp gun could pierce a plate of 22.05 in. and 22.69 in. in thickness respectively. Besides its greater power of penetration, the Krupp gun, though 8 calibres shorter, also shows a materially higher efficiency per pound weight of gun.

As another example let us compare the 4.72 in. Canet siege gun 26 calibres long with the Krupp gun of the same calibre 24 calibres long. The dimensions and weights are given in Table V.

The particulars as to the dimensions of the Canet gun have been taken from the *Revue d'Artillerie* vol. xxxiv., page 559, and the firing data from vol. xxxvi., page 175, of the same journal. The figures have been selected from those obtained at a series fired at the Hoc Polygon, twelve of which were fired with C₂ brown powder, one with C₂ black powder, and 13 with C.N. powder, sample 155-1889. The black C₂ powder proved less satisfactory than the others. The best results obtained with the C₂ brown powder and with the C.N. powder have been selected for comparison with the Krupp gun.

TABLE V.—PARTICULARS OF CANET AND KRUPP 4.72-IN. SIEGE GUNS.

	CANET.		KRUPP.	
	mm.	in.	mm.	in.
Calibre.....	120	12.72	120	12.72
Length in calibres.....	26		24	
	kg.	lb.	kg.	lb.
Weight of gun.....	1430	3153	1420	3131
" carriage.....	1650	3638	1700	3748
" projectile.....	18	39.68	{ 16.4 20	{ 36.16 44.01

The first pair of results shows that with the Canet gun a projectile weighing from 39.7 lb. to 42.3 lb. was given a muzzle velocity of 1687 ft. with a charge of 10.1 lb. of brown C₂ powder, the pressure on the chamber being 13.84 tons per square inch. The Krupp projectile weighing 44.1 lb. was given a velocity of 1640 ft. by a charge of 11 lb. of powder, the pressure being 14.17^{+2}_{-29} tons per square inch. Both the total energy and the energy per pound, per inch of circumference, and per square inch of section are greater for the Krupp gun. (See Table VI.)

If now we compare the results obtained with B.N. and W.P.C. powders, it will be seen that the Krupp gun again shows to advantage, as it gives a velocity of 1943 ft. to a projectile weighing 44.1 lb. with a charge of 5.3 lb. of powder, and a pressure of 15.54^{+13}_{-26} tons per square inch. On the other hand, the Canet gun with 7.2 lb. of powder and a pressure of 10.23 to 12.2 tons, only gave its projectile a velocity of 1893 ft. per second, and the energy both total, and, as referred to the several units, is less than in the case of the Krupp gun. The experiments further show that the German smokeless powder is much more effective than the French.

CHANGES AND PROGRESS IN MILITARY MATTERS.

Extract from COLONEL H. HILDVARD'S Compilation.*

CAVALRY, INFANTRY AND ARTILLERY.

MANY writers, and especially French writers, have exaggerated the effect of the employment of small-bore rifles and smokeless powder upon the action of cavalry. The reply to all such exaggerations is that the tasks for the cavalry—and this is the case with all arms—will only be more difficult, and entail greater sacrifices, not more restricted or impossible, and that changes of principle in training and tactics do not appear to be at all necessary. Scouting, in the main, is conducted at distances at which even the best fire-arm can cause no loss. Not from the front, shot at by the enemy, but from the flanks and rear unmolested by hostile fire; not as a target, but carefully hidden and concealed; not within the sphere of the enemy's fire, but from points at a distance that afford good observation, and by means of glasses will the mounted man bring his news. He must not begin to endeavor to gain information after the enemy's position is occupied; he must have seen beforehand what moves into the position; to fix the flanks of the position, that is, the position itself in its entire extent, will not then offer any special difficulties.

For the attack, especially against infantry, careful waiting and a thorough reconnoitring of the opportunity; holding back the closed bodies at long distances and out of the enemy's fire more than hitherto; the habitude of long gallops, so as to arrive at the right time and pass through the fire zone as quickly as possible; the most complete use of ground; the most skill-

* Colonel von Lübel's Annual Reports upon the Changes and Progress in Military Matters during 1890. *Journal of the Royal United Service Institution* for November, 1891.

ful leading; boundless energy in the collision; all this will allow the cavalry man also to fulfil his task on the battle-field also in the future.

The *Jahrbücher für die Deutsche Armee und Marine* (November) points out the great penetration of the new bullet, and argues that the formation in two ranks must be altogether discontinued and be replaced by rank entire, at least for the attack on infantry. But for the attack on infantry, close lines with sufficient depth are specially important. The fear of the increased penetration could be met by riding with intervals, as is provided for in the new Italian regulations.

It should further be a maxim with all cavalries that successful results are possible in appropriate situations, even against infantry in a set battle.

"All the experiences and improvements in fire-arms have done far less harm to cavalry than the misappreciation of its nature in its training and leading. Smokeless powder and magazine rifles can alter nothing in this."

The *Russian Invalide* adheres to this view. In its Nos. 76, 77 (Colonel Suchotin) it lays down that the entire training of man and horse have but one object—the attack. The rider must get a real passion for this. During manœuvres each body of cavalry must make at least two attacks daily, one of which against infantry. These attacks should never be ruled by the umpires to have failed, not even when there has been no prospect of success.

The *Wajenny Sbornik* (Nos. 6, 7), in a comparison of the Russian, Austrian, and German cavalries, comes to the conclusion that all are unanimous regarding one point, that cavalry attacks against infantry—against unshaken infantry is meant—will have still a good prospect of success if, on account of the losses to be expected, caution be displayed.

Dismounted action is, and remains, a make-shift for some special cases, as, for instance, the defense of cantonments, the temporary occupation of important points until infantry can come up, the defense of defiles with a view to checking a pursuing enemy and covering the retreat, to force a crossing or a passage that it would be too far to turn, under certain circumstances to protect batteries, and, lastly, to disturb an enemy that cannot be attacked.

The *Militär Wochenblatt* (Nos. 10, 13; also translated in the *Revue de Cavalerie*, December) lays stress on the dangers that the dismounted action of cavalry entails. Each leader, therefore, before he decides to resort to it, must ask himself whether the result to be gained is worth the eventual losses. The loss of one man entails that of a second, who must lead the horse of the man killed. The weakest point is the led horses; a strong mounted reserve should be thought of before everything. Attacks on them, on the other hand, are very paying, and it is of more value to scatter the led horses of an enemy's dismounted cavalry than to cause him material losses by fire. An engagement should never be undertaken in open ground, for here the enemy's cavalry might act destructively. It should never be carried through, but only up to about 650 yards, or remounting, in itself a very dangerous moment, may easily lead to a catastrophe. The breaking off of the engagement should be done by groups, quietly and unremarked, without commands or signals. Sufficient training and exercises in fighting on foot and in firing are indispensable; but all exaggeration is to be avoided.

The necessity for keeping the cavalry together in masses, if results are to be expected in battle, is again referred to. All modern leaders of cavalry, says the *Russian Invalide*, as General Wrangel, Prince Frederic Charles, and General v. Schmidt, have all expressed themselves in this sense. It has been admitted to be absolutely necessary to have exercises in large bodies in peace, so as to accustom both men and leaders to fight in masses. And this was done in 1890 by cavalry divisions in all the principal European armies, and in larger combined bodies in several of them, especially in the Russian. These last took the form of opposing forces, the one of 50 squadrons and 24 guns, and the other of 54 squadrons and 36 guns, which operated against one another in Volhynia. It was noticeable that dismounted action, for which Russia has in the past shown a certain partiality, was very little employed, and frequently not used at all in situations adapted to it. The Officers' patrols worked satisfactorily, but the general scouting and the maintenance of communication were not always sufficient, and consequently numerous surprises occurred. The artillery was not always sufficiently protected by special escorts.

As regards tactical formations, simplicity is again recommended as the first requirement for their application in war, in the rapidly passing phases of the cavalry engagement. The employment of simple movements, known to every individual in the great mass, can alone afford a certain guarantee for good execution, on which success exclusively depends; whatever is complicated is only calculated to cause confusion. In practice, as was shown by the great manoeuvres, all are agreed in this; always to employ the same simple evolutions and to form line in the same way. The necessity for other formations, such as are still retained in the regulations, ceases entirely with this agreement. The director of the last exercises at Châlons, for instance, found fault especially with the commanders of regiments for frequently losing time during the preparatory days with practising every possible kind of movement contained in the regulations, instead of seeing to the most perfect execution possible of simple formations.

In Germany, the Felddienstordnung of 1887 has undergone some not unimportant changes as regards the cavalry, in consequence principally of the new arm and the new powder, as well as of the new infantry and artillery regulations. The introduction has received an addition regarding the extended sphere of duties of the cavalry officer, in regard to swimming exercises, the execution of demolitions and blowing up of railway lines, and exercises with the telephone and the telegraph. The two cavalry regiments hitherto belonging to the mobilized army corps are to form, in future, the Corps-cavalry Brigade; divisional cavalry has ceased to be an integral portion of the infantry division, and the attaching of cavalry formations to the infantry divisions is to be left, in future, to the corps commanders. Thus the two regiments will, in the main, be under a single command, ready for combined action, which should contribute materially towards preventing these regiments being frittered away. Pioneer detachments are, in future, to be attached to cavalry divisions as well as to the horse artillery; they will be carried in vehicles belonging to the train, or in requisitioned ones.

In general, the value of night exercises has not been estimated sufficiently

highly. In Russia alone almost have they been practised. But undertakings by night will play an increased rôle with cavalry in future; it is therefore of great importance that the troops, both those acting by surprise on the offensive and those surprised, should be made accustomed to the impression of fighting by night, with its confusion and dissolving influences, so as to avoid serious reaction. Patrol duties, particularly, should be thoroughly practised by night, by which the men's facility in finding their way will be much increased.

The question of arming the cavalry with the lance is by no means generally settled. In France, the front rank of the Dragoon regiments are, in future, to be armed with it. But in Russia the feeling is very strong that the example of Germany in this respect is not one to be followed. The whole value of cavalry is centred in its offensive spirit, in the desire of each man to get to the closest quarters with his opponent. This, it is argued, can alone be fostered by cavalry being armed with the sword, the offensive weapon *par excellence*, whereas the lance pre-supposes the enemy being engaged at a certain distance and in a way to foster a spirit of self-preservation. History is against the lance, for the best cavalries, those of Gustavus Adolphus, Charles XII., Frederic and Napoleon, carried no lances.

A magazine carbine has been introduced in Germany, France and Austria.

In Russia and Germany special value is attributed to swimming exercises.

Everywhere the training of the necessary personnel for the telegraph service is being continued. Last year's reports dwelt on the difficulties experienced in this direction, and it has now been brought more to light that the employment of this technical auxiliary in the first line restricts the high mobility of present warfare, and that its chief value is rather for stationary conditions. But then the telegraph would be less the element of the cavalry man. Even in the peace experiments serious friction has occurred in its working, which would be materially increased by the uncertainty in an enemy's country. Perhaps, therefore, the extended employment and the consequent great use of telegraphs with advanced cavalry, and especially with patrols, should not always be counted on. But there can be no doubt that, under some circumstances, a knowledge of telegraph work may be of use to the cavalry soldier.

Marine Infantry (France):—A completely new organization has been given to the marine infantry. That portion of it in France is, in the event of war, to be employed in the support of the land army, and embodied with it. The intention is to form from it a new Army Corps (the 20th) *to be dissociated from the Marine Department and placed under the Minister of War.*

Since the 1st March, 1890, the marine infantry has been composed of 177 active companies formed into 12 regiments, 4 independent battalions, and 5 detachments.

Arm and Ammunition (France):—The requisite number of rifles, pattern 1886, for the whole of the formations of the second line, were to be completed in 1890.

The following distribution of the ammunition carried in the field is taken from the "Aide-memoire de l'officier de l'infanterie en campagne":

Each infantry man carries on him.....	108.0	rounds.
In the company wagon there are in each of the two ammunition boxes, M/87, 7808 cartridges, which gives per man.....	61.4	"
In the battalion ammunition wagon there are car- ried 25,920 rounds, or per man	25.9	"
In the ammunition column, sections 1 and 2, there are per man	65.7	"
In the artillery park per man.....	43.5	"
In the army park per man.....	105.0	"
Total rounds per man.....	409.5	

Artillery (France):—No changes have taken place in the organization of the artillery; but it is intended this year (1891) to increase the peace strength of the field artillery by 580 officers and 2738 men.

It is probable that there will be a further increase to provide for the requirements of the new 29th Army Corps, the formation of which is contemplated.

The Marine Artillery, which it is intended to place under the *Minister of War*, consisted, on the 1st of July, 1890, of 22 batteries in France, besides 13 batteries and 2 detachments in the colonies. Of the former there are 7 batteries at Lorient, 5 at Cherbourg, 3 at Brest, 2 at Rochefort and 5 at Toulon.

Field Artillery—As in 1889, the development of field artillery tactics during 1890 was influenced chiefly by the introduction of smokeless powder, now generally adopted by the principal European armies. Although a complete judgment cannot even yet be given regarding the consequences of this new discovery, still a considerable clearing of opinions has taken place. Whereas in 1889 the views regarding the importance to be attributed to smokeless powder differed very widely, now all are unanimous that the introduction of the new compound implies a considerable advance in every direction, and that it is especially the artillery, which has suffered the most from the disturbing influences of the smoke cloud, that will derive the greatest advantages from it and will gain in importance. Whereas in 1889 this subject was still debated and all the discussions on it in print had a more general character, in the course of last year it was clear that those only will gain by the new discovery who understand how to adapt their mode of fighting to its peculiarities. The question, therefore, which occupied much attention was what changes would be required in the employment, organization, and training of the arm in detail, so that it should not only profit by the advantages of the smokeless powder, but especially also so that it should overcome the increasing difficulties caused by its use by the opponent.

An increase in strength has been obtained by arming the horse artillery with the heavy field gun, which really weighs no more than the light but ballistically inferior, field gun. The realization of the long-cherished thought of an uniform gun, which had been long regarded as altogether im-

possible, is of still greater importance. The chief advantage gained by this is in the uniformity of the ammunition, owing to which its replenishment, particularly in the case of the horse batteries sent to the front with the cavalry divisions, is facilitated, for any battery can assist them.

Having in view the increased importance of thorough training, especially in firing, the Field Artillery School of Gunnery has been increased by a 3d instructional battery and the creation of a Staff for the instructional detachment formed from the three batteries. The number of officers instructed each year is double what it used to be, and, shortly, every officer nominated to the command of a battery will have gone through a course of the school.

The new gunnery instructions for the German field artillery, issued in May, 1880, have been received cordially by the entire arm.

The rules for gun practice have not in themselves been radically altered; even the introduction of the double fuse for shrapnel and of smokeless powder have not made such a step necessary. What is new are rules for firing at covered objects with explosive shells, firing at captive balloons, and firing at night.

The question how the infantry attack against intrenched positions is to be prepared by artillery fire has been decided in Germany by the introduction of a breaking-up shell loaded with a powerful explosive and provided with a double fuse. By this step the German field artillery has been placed in a position to participate with the whole of its guns in this task, and as indicated in the Musketry Instructions, at distances over 3300 yards. Lieut.-Gen. v. Sauer advocated, in the *Militär Wochenblatt*, special mortars, as well as explosive shells. In our opinion, against living objects, equally good, if not better, results are obtained with explosive shells from field guns, as with a 12 cm. shrapnel from a mortar or a howitzer. The published reports of the experiments that have taken place at Krupp's and Gruson's with these guns leave no doubt but that this is the case. Indeed, even with the 15 cm. mortar shrapnel the breaking-up shell from the field gun has nothing to fear from a comparison, as seems to have been demonstrated by the experiments carried out at Meppen in 1887. On the other hand, these high-angle firing guns have a very restricted utility for all other purposes of field service. If much greater effects are required against concealed objects, and if shelter has to be destroyed, it will be necessary to introduce high-angle firing guns supplied with high explosive projectiles. It is quite clear that they will then surpass the effects obtained from field guns with breaking-up shells; but this is not alone a consequence of their greater weight, but also of the more favorable course of their trajectory, which allows of the concealed objects receiving really a fire in their rear. But as special guns in the field artillery always entail great evils, in our opinion this should only be resorted to when it has been shown that the effects of the breaking-up shells from field guns are inadequate.

The question is different when it relates to separate heavy batteries, composed of siege guns manned by foot gunners following the field army for special purposes, such as fighting about intrenched positions. In this case all the considerations that can be urged against special guns of the field

artillery do not apply. But their employment hardly then belongs to the tactics of field artillery, but they must be subjected rather to the rules that apply to fortress warfare. But General v. Sauer goes still further, for he expresses the opinion that even in the artillery fight the mortar is better than the gun. This is a view that is quite correct for fortress fighting but not for the field. Were it to be so the field artillery would have to be composed, logically, of high-angle firing guns; for these would be better adapted for all the work that has to be done by the artillery of the attack—the carrying through of the artillery engagement and the preparation of the infantry attack. Guns would only have a justification on the side of the defenders, because they would frequently have to deal with moving troops. We think that the error—*sit venia verbo*—of General v. Sauer lies in the fact that he considers material cover to be necessary for guns in the field, whereas it is quite sufficient if they are covered from the enemy's view by the skilful use of such screens as the ground offers.

The question of the employment of quick-firing guns has been somewhat cleared. The conviction has gained ground more and more that the quick-firing gun is not a special class of gun, but rather the most perfect type of the existing gun. The quick-firing guns of small calibre, which would, it was hoped by some, form the future arm of the field artillery, have been followed lately by others firing projectiles of the weight of those now used. There can be no objection in principle to the introduction of these. But it may be remarked that the rapidity of fire of the field gun has been materially increased of late years. A paper on "Quick-firing Guns" in No. 12 of the *Militär Wochenblatt* for 1890 is worthy of attention.

LETTERS ON INFANTRY.

BY PRINCE KRAFT ZU HOHENLOHE-INGELFINGEN.

From the French of PROFESSOR ERNEST JAEGLE.

BY LIEUT. J. C. BUSH, 5TH ARTILLERY.

XIV.

THE EXERCISES OF A BRIGADE.

THE brigade is the largest unit of infantry which in time of peace practices exercises independently of the other arms. In war it is not desirable that an isolated brigade, that is to say one not in combination with the other arms, should be detailed for any duty or otherwise employed. If in a planned battle, the brigade is assigned either as the reserve or as the main body of a division or as a fraction of a larger infantry mass, the officer commanding it will not, as a rule, have artillery and cavalry directly under his orders. He should act not the less in entire harmony with the artillery which sustains his attack.

But when the infantry brigade is detached and acts as an independent body, artillery and some cavalry will always be attached to it. Indeed ac-

cording to the normal distribution of our troops, some artillery, ordinarily more than one battery, is added to the infantry designated to form the advance guard of an army corps. During the last war we never saw an infantry brigade detached without artillery. Further, we saw that when it became necessary to send one brigade of an army corps to the support of another corps, as at St. Privat in the case of Knappstadt's brigade of the Guard which was detached to the IXth Corps, artillery was also attached to it, although all the artillery of the IXth Corps was fully occupied. For this reason it appears to me absolutely necessary that in time of peace no brigade should execute any evolution without being accompanied by artillery. It does not appear to me as indispensable that cavalry should take part in the exercises of infantry brigades, for during an infantry fight the cavalry will, for the greater part of the time, limit its action to reconnoitring, and at the manœuvres their reports can just as well be considered as delivered, since the enemy is either imagined or simply marked by flags. The moments are rare when cavalry will be called upon to take part in an infantry fight by charging. The squadron attached to an infantry brigade would therefore remain inactive during the greater part of the manœuvres and would lose valuable time which would otherwise be devoted to its own proper instruction.

It is entirely different with the artillery. This arm during all the fighting exercises of the infantry brigade will be fully occupied. It will even commence the action sooner than the infantry and keep up its fire later because its range is greater than that of the latter. During the whole period of the infantry manœuvres it can thus continue its own training and can even carry this out better than if it were alone, for the infantry affords it a tangible object to fight for which otherwise could only be supposed.

I can almost hear you make the objection that for the same reason the infantry regiment should not manœuvre without artillery, because, if it is detailed to form the advance guard of a division, a battery will likewise be added to it. I agree with you that it would be very desirable to add a battery of artillery to a regiment of infantry for use during its fighting exercises, and when the two arms are represented in the same garrison it often happens that the commander of an infantry regiment asks for and receives a battery if the artillery can spare the time for this purpose.

But the infantry regiment has no need of the artillery for all its exercises. It has to practice the formation for parade, the march past, the advance in line of battle and the elementary movements in masses; it must carry out long movements which are made at route step, and learn to open out and close intervals, to practice movements in different lines with or without the deployment of the company column, etc., of which the artillery, if attached, would be merely idle spectators, losing in consequence their own time for instruction. But with the brigade it is quite different. I consider that all exercises of a brigade which do not simulate some situation in an action are entirely useless.

Regarding parade formation, the brigade need never practice it, for if the regiments can parade well, it will only be necessary in case the brigade should be united for review, to practice the bands together in order that the

drums should keep good time and not spoil the parade. My opinion seems also in harmony with the method adopted by our highest authorities for inspecting brigades, since they ordinarily form them up for fighting exercises and neglect the parade and march past. There exist certainly some brigade commanders who have a weakness for practising their entire brigades in the manual of arms. This is easily done and merely requires a little knack, which consists in battalion and regimental commanders giving exactly simultaneous commands. The regulations make no mention of this; which is merely something to please the eye, and having no tactical value, constitutes simply a waste of time the more lamentable as there are ordinarily only four days available for brigade exercises. In other respects it injures discipline to practice manual exercises by brigade. For the brigade commander cannot look after the motions of every man and the other officers having no right to interfere, cannot even look after their own men. Therefore the men not in the front rank quickly become accustomed to execute the manual badly, for they know that they will not be noticed. It would be well therefore to forbid these exhibitions, for they extend too far the meaning of the first sentence of the 19th chapter of the regulations.

All the evolutions prescribed in this chapter for the exercise of a brigade can be very well thought out and executed under the supposition that the enemy is near. Hence the action of the artillery will be indispensable in order to occupy the enemy, to stop him and turn his attention from the brigade so that the latter can carry out its movements correctly. But in this case it will be very difficult for the artillery to choose at once the best point for its position where it can fire as long as possible without hindering the movements of the brigade and at the same time support it up to the last moment. This requires careful study and practice in order to be properly executed.

Let us take for example a simple change of front of a brigade and see what would be the best position for the battery to take up in order to open fire immediately on the enemy whose appearance has caused this change of front. This position should be so chosen that the brigade during and after the change of front does not form a kind of butt for the shell fired at the battery, and on the other hand that the brigade, after having changed front, can advance against the new enemy without masking the battery or hindering its action. This position, to which the battery should hurry by the shortest route, will vary according as the brigade makes an entire or half change of front. At the same time the distance that the artillery can advance to the front or move from a flank of the new line should be determined so that it can aid the brigade as long as possible without going so far from the infantry as to expose itself to disagreeable surprise. In any case, this position, if the nature of the ground permits, will be in front and to the flank of the inner wing of the brigade as it stands after the change of front. That follows as a matter of course. But to find this position quickly requires judgment and practice. The artillery must therefore be given opportunity of practising it.

Besides it is not for the artillery alone that this practice is desirable. The infantry need practice in a much greater degree in order to act in har-

mony with their artillery. For, from the time the latter have once come into action and have opened fire, they should not be disturbed in position on account of the infantry or ordered to move elsewhere. For the artillery will have become in a measure stationary.

When artillery has occupied a specified position, it will range itself there and determine the distances to different points, and should not be ordered, unless absolutely necessary, to change place, because, in a new position it will lose a certain amount of time while obtaining the range and attaining the full effect which it is capable of producing.

Now it is very difficult for the infantry, who are advancing from their original position against the enemy, and who have their attention principally fixed upon that enemy, to think of their own artillery in order not to mask it. For to do that they must not only watch the enemy who threatens them in front, but also their own artillery which they have passed. In this case also skill and practice are necessary in order to find the proper position and from that position to lead the infantry in the right direction. Any mistake committed in this regard at first will be very difficult to repair on account of the inherent slowness of infantry movements, while the time required to effect a change will entail very considerable losses.

We may assert in theory that when the firing line threatens to mask the artillery, the latter can send word to the infantry to oblique away. That is easily said, and at manœuvres, is easily done. But if you once try in actual battle to go forward from the flank of the artillery line, while in action, to the firing line, also engaged, you will admit that it can seldom be done with success. It is true, I saw it done once by the then Lieutenant von Roon, who rode forward from the guns to the skirmishers during a reconnoitring action at Satrup on the 10th of February, 1864. The hail of bullets which fell around him in the snow showed clearly how rarely such an effort could succeed.

At St. Privat I was twice compelled to call back to the lines some skirmishers who had pressed forward too far and masked my batteries. I could judge the risk I ran by the whistling of the bullets about my ears, and was astonished to find myself coming back safe and sound. My horse was not so fortunate.

I have heard, indeed, that Lieutenant von Esbeck, of the Hussars of the Guard, in this same battle, twice rode along the line of skirmishers carrying reports and orders, and this in his red uniform and on a white horse. But the fact that on this day the greater part of the field officers, aides-de-camp and adjutants of the infantry of the Guard were either killed or wounded shows that Lieutenant von Esbeck must have had as much luck as bravery. As a general rule, it will be necessary to give up all idea of sending orders to a line of skirmishers who have opened fire and are being fired upon. Instructions must be given before sending it forward, afterwards it can only be directed by means of signals or urged forward by reinforcements. Think what will be demanded of this skirmish line now lying down, firing and under fire, if you ask it to rise and oblique in order to clear the field for artillery fire! Half of the command would certainly be killed during this flank march.

It is, therefore, absolutely indispensable that the infantry should attain quickness of judgment and learn by experience how to advance against the enemy and pass its artillery without masking it. I know very well that in one of the preceding letters I said that infantry could be posted at a certain distance directly in front of artillery while the latter were firing. There are circumstances where it is difficult to avoid firing over the heads of our own infantry, but it is also true, and I have so stated it, that infantry lying down a short distance in front of their own artillery, run considerable risk.

This very occasion at St. Privât, when I called back the skirmishers, convinced me of this beyond doubt, for, hardly had I caused the skirmishers to turn back when a shell burst in a gun and came out like canister, which must have struck the skirmishers in the back had they remained in their former position. Now, nothing in the world throws troops into worse confusion than to receive fire from their own comrades in rear. I have verified this on many occasions. I do not believe it possible entirely to avoid having shell burst in the bore notwithstanding the many inventions and technical improvements. I have noticed that these accidents only happened on very dry and hot days (at St. Privât, Sedan, and especially at Montmédy), when they were quite frequent, especially when the cannonade had lasted for some time. In damp weather and in winter they did not occur. I have come to the conclusion that on hot days the fouling from the powder dries very quickly and forms a sort of hard crust which breaks up the shell. No change in the construction of the gun can remedy this. Let us add, also, carelessness on the part of the cannoniers. But it is impossible to determine anything of this after a second shot has been fired, that can only be done at first.

Other circumstances again plead in favor of attaching artillery to the infantry brigade during all its exercises whenever feasible.

In a former letter I have mentioned how important it is that the infantry, as they pass the artillery in their advance, should inquire the range of the latter, and how a really effective fire from the infantry depends upon this. Now, at brigade exercises this should be made habitual with the infantry and they should learn to consider it as a matter of regulation, otherwise they will always forget it at the manoeuvres on account of the great haste which prevails there, and then will neglect it in war also.

You will have seen in one of my former letters (the 11th) by what means I consider that the artillery and infantry can best work together in the future. When the attacking artillery has once silenced that of the defense in the artillery duel at the longer ranges, the infantry will advance in attack formation while the attacking artillery will move forward in two échelons to within about 2200 yards of the object of attack. Protected by this artillery fire, the infantry will advance, without firing, until the foremost line of skirmishers has, if possible, arrived within 440 or 550 yards of the object of attack. There they will establish themselves and open fire.

Now comes the time when the artillery, under cover of the infantry fire, can approach to within 1100 or 1200 yards, if it has not done so before, and advancing by échelon with their infantry, can, in concert with the skir-

mishers, cover the enemy with such a fire that the infantry may advance still further and make the final assault.

But in order to obtain this mutual understanding, this perfect play of parts, constant practice is necessary, without which nothing can go well in presence of the enemy. And it is at brigade exercises that this combined attack must be practised in order that the principles may be grasped by those engaged in it and engraved in their minds, for at manœuvres the condition of ground involves so many modifications of these principles that it will be no longer possible for the men to recognize them.

It follows from all this that it is very necessary, or at least very useful, to add artillery to infantry for all brigade exercises. Why, then, you will perhaps say, does not the Minister of War in his annual orders apportion some artillery to the infantry during the greater part of the days of exercise? But you forget that the orders of the Minister must be general in character and applicable to all brigades. Now many of the infantry brigades have their exercise ground so far from the nearest artillery garrison that the batteries cannot arrive in time for the first days of exercise if they are also to complete their own special artillery training. But this need not prevent any infantry brigade, having artillery quartered in the same garrison, from making an arrangement with the artillery so that on each day of exercise at least one battery shall combine its training with that of the infantry and the two arms manœuvre together.

When I commanded a division, although I had no artillery permanently under my orders, that did not hinder the chiefs of this arm from complying most obligingly with my wishes. Nor did I think that this would controvert the intentions of the Minister of War, even if he had ordered that as a rule no artillery should take part in these brigade exercises. For these general orders have no other object than to diminish the cost of the training; when, therefore, a battery can take part in the brigade exercise without expense, no objection can be made.

It may be urged that the infantry brigade must practice elementary evolutions such as deployments, opening out into two lines, formations for assembly, etc., for which artillery are not needed. But, on the other hand, might not artillery be used perfectly well to occupy the enemy during these evolutions? Or, in case of the assemble formations, these might be practised during the first half-hour and the artillery come up that much later.

Concerning the arrangement of the brigade exercises, it is always a very difficult matter—considering the limited number of days, four at most, granted for this purpose—to go over even once, and very rapidly, all the combinations suggested in the XIX. and XX. chapters of the regulations. The brigade commander must prepare in advance a plan carefully considered in all its details. For this reason, when I commanded a division, I was particularly pleased whenever the corps commander decided that the day of inspection was not to be used for any special display but simply for training, like the other three, during which he was simply to look on, and by this means judge of the progress of the brigade. In this way the day of inspection was not lost, and whether it came on the first or last day of the exercises, a part of the programme embraced in the entire period could be

carried out. In this way only was it possible for us to at least glance at each portion of this vast field of exertion. And more should not be required, for so large a mass as a brigade must give up the method of training by repeated practice which can be applied to a company. It will suffice if the brigade commander makes what he wishes done in each situation understood, whether it be by fully working out some phase of a combat or by investigating the causes of faults and misunderstandings and showing how to prevent a recurrence of them. In this manner every situation can be worked out in the spirit of the regulations with greatest profit and instruction.

Is this always done? I will refrain from answering the question and instead will ask you a number of others. Do we always observe the requirements of parts 1 and 2 of paragraph 107 of the regulations? which lay down that care must be taken to give timely support to the first line which is far distant and in open order; and that, ordinarily, advanced posts should not be occupied which favor only a temporary defense. Can we not state, on the contrary, that very often an advanced line is pushed forward with instructions to fall back, "when necessary," which, in an actual engagement, would be almost annihilated and thus exercise an unfavorable influence on the main line?

Would it not really be of advantage to a brigade if a battalion now and then took up another position than that which it usually occupies? Do we not hold too pedantically to the directions of the regulations which require that in brigades with even numbers, the fusilier battalion shall be posted in the left wing, while in those with odd numbers it shall be in right wing? This direction which now tends merely to improve the appearance of a division when massed, dates from the time when the fusilier battalions received a special course of instruction and were principally employed for fighting in open order.

Do we not attempt too often to work out the case of an indecisive (see page 174) attack by purely regulation movements ordinarily impracticable under the circumstances?

Are not the attacks of columns ordinarily executed in company-columns, contrary to the spirit if not to the letter of the regulations, in preference to battalion-columns?

Is the employment of regiments by wings, as intended by paragraph 127, page 187, made an "especial" matter for practice?

Do we see the second line (pages 189 and 190) generally employed rather as a reserve and retained in rear, especially when the first line has formed an advance line? or, do we give preference to the method indicated in paragraphs 119 and 120 where the brigade advances in such a way that the regiment of the first line pushes forward the flank companies of the battalions as an advanced line and follows them with the centre companies as the principal line, while the second regiment forms the second line with entire battalions at deploying intervals and moves at battalion distance from the first line?

Do we avoid change of lines (as laid down on page 190) as much as possible in the fighting exercises of the battalion?

Do we observe the instructions, formulated on the same page, which require that the second line should be brought into action on the flank of the first and not pushed through it? Or else do we not generally see the second line pushed systematically through the intervals of the first even though it be in battalion columns on the centre?

Do we conform to the recommendations given on page 192, always to spare the strength of the men, and are all lengthy movements properly made in route step at quarter section distance? Are "Order arms!" and "Rest!" always given when it is possible to do so?

When the brigade marches to and from the exercise ground, does it always form an advance and rear guard if marching as a whole? (page 192) Does this march thus become a part of the training; or do we not see the brigades generally march to the exercise ground without any tactical idea or thought as to instruction, making a simple halt, and thus uselessly wasting their time and strength?

I could give a favorable reply to these questions in so far as they relate to the brigades which made part of the division which I commanded. I cannot offer an opinion as to the other brigades of the army.

I have already mentioned the formation of the regiments of a brigade by wings in two lines. I must acknowledge that this was a favorite hobby of mine. I regret that the regulations have not made this a regular formation and have not regarded the employment of lines of regiments as exceptional. I have already mentioned how advantageous the first formation is; since the regiments, when the lines in rear advance to sustain those in front, are not mixed together and the regimental unit is not broken up. It is a fact moreover that in most of the battles of the last war the regiments fought side by side, that is in two lines by wings, rather than one regiment behind the other forming two lines of regiments.

This method of employing regiments in lines, which in former days was the only regular formation, may easily take place still, when a brigade deploys for action on the march. The leading battalion upon meeting an enemy as yet unknown, gradually widening its front, presses into the fight, and is successively supported by the two battalions which follow. The tendency to develop as great an amount of fire as possible, and to work against the flanks of the enemy, leads to a too great extension of the fighting line which becomes too thin and causes a tendency to detach companies and thus weaken the front. Nothing is then left but to strengthen this thin front by deploying the next regiment as a second line. But this is always an evil—nearly always the result of a fault. For one has either been surprised by the enemy—which implies that the cavalry have not reconnoitred well—or one has allowed one's self to be drawn too hastily into a general engagement, without making proper arrangements in advance, and is thus forced to send in the battalions one by one as they come up. Sometimes it has been impossible to reconnoitre the enemy so as to be well informed, because the character of the ground has prevented a reconnaissance, then one can only learn his increasing strength gradually as more troops are brought into action. In this case no fault has been committed but the situation is none the less unfortunate.

The most striking example of this mixing up of regiments is that afforded by the battle of Spicheren. We finally find there in the forests of Gifert 40 companies mixed up together belonging to five different regiments and to three different army corps. We find parts of one regiment, the 74th, scattered along the whole front of three miles, from the extreme right in the forest of Styryng to the extreme left in the forest of Gifert. Every one knows how the direction of the struggle in this battle was rendered difficult by this same mixing of units, and we should avoid it wherever possible.

In almost every case where the troops were sent in according to a pre-arranged plan and particularly when they could be ordered into the fight from their assembly formation, the formation by wings was used. But to my mind this method should be ordinarily practicable even when the brigade is forced to pass directly from the formation for march to that of combat, it is only necessary to establish such a rule and practice it at the exercises.

For at the time when it becomes necessary to reinforce the leading battalion, which has attacked the enemy, by the second, if we see that the foe makes a more obstinate resistance than was at first expected, we should be able in most cases to determine during the combat of this battalion, which must last for some time, whether there can be any question of using the whole brigade. The second battalion can then be sent to the support of the first with orders to prolong the action and not engage themselves too closely. The third battalion can be placed in reserve and, under cover of the delaying action, the last three battalions can be formed in two lines on the flank of the first three. Only when this deployment has been completed will the second regiment be brought up beside the first and the fight be brought to a decisive end.

If we follow this rule during the exercises in time of peace we will see the separate advance of battalions become rarer in war, and also the consequence of this fault, that is the mixing up of battalions and companies belonging to different regiments.

I have also mentioned that the endeavor to exert pressure on an enemy's flank leads to an excessive extension of the first line. I acknowledge that this tendency is fully justified. The first fight which I saw in the open field, that before Schleswig on the 3d of February, 1864, furnished a striking example of this.

General de Gondrecourt's Austrian brigade attacked the enemy with incomparable bravery and stormed Ober-Selk and Koenigsberg. But it left on the ground an enormous number of killed and wounded. Two battalions were sent against the village of Jägel, and in front of it were drawn into a costly fire-fight which made little progress, especially after Colonel Benedek had been carried from the field seriously wounded. By dint of great exertions the assailants were able to penetrate into the village just as a company of the "Augusta" regiment, moving by another road, appeared on the right flank of the enemy. This produced a marvellous effect. The enemy fearing to be out-flanked abandoned the village and surrounding hedge, leaving in our hands many dead, wounded and prisoners. For the company had surprised them, and opening a rapid fire on their right flank, had profited

by the confusion and disorder which this had caused, to rush in on the village. Only one man of the company was wounded and that in the finger.

A few days later the "Belgian" regiment of the second Austrian brigade, in combination with the 9th battalion of the Prussian chasseurs, stormed the position of Oeversee, which was very strong in front. The Austrian battalions again suffered enormous losses, especially on the right, where they crossed over the frozen lake against the wooded heights. It is doubtful whether they would have succeeded, in spite of their lion-like bravery, if two companies of chasseurs had not turned the right flank of the enemy, and if two battalions of the infantry regiment of Hesse, which followed, had not threatened his left flank so much that he abandoned his position and retired.

But it must be clearly understood that such a flank attack can only succeed, in the greater number of cases, when a second line of approach is available, or when a force charged with this duty can be detached while still out of sight and beyond the enemy's fire. If these two conditions cannot be fulfilled, there remains no other way than to deploy our front so that it shall be longer than the enemy's, and finally wheel round the overlapping wing upon his flank. But troops which endeavor to make a flank attack in sight of the enemy and within reach of his fire will find themselves out-flanked during the movement by the enemy's front and will probably be put out of action. I have explained this before under the head of "Combat of the Battalion," and beg pardon for wearying you with a repetition. But I have so often seen complicated flank movements made in time of peace within reach of the enemy's fire, that I feel myself warranted in again insisting on the fact that flanking movements must be carried out so that the enemy shall not immediately discover them, and shall not have time to make proper dispositions,—in such a manner, in fact, that the attack shall take the enemy by surprise.

If we study the examples furnished by military history of flank attacks which have obtained decisive results, we shall find that they have succeeded by the use of a second line of approach or by detaching troops charged with this duty at such a distance in rear that they were always able to attack by other lines of advance. I may mention as examples of flank attacks, on a large scale, that of Davoust against the Austrian position at Wagram, that of the II. Army against Benedek's position in front of Königgratz, and the turning of the French position at St. Privat by the XII. (Saxon) Army-corps.

But let us take in preference the action of smaller masses of the strength of a brigade where the flank attack, delivered by a battalion or even a smaller unit, has decided the struggle. In the previously mentioned fight at Jägel, on the 3d of February, 1864, the company of the "Augusta" regiment, which fell upon the Danish flank, came up by the line of march of the Guard division. In the combat at Oeversee on the 6th of February, 1864, the two companies of chasseurs which decided the struggle for the possession of the forest were detached as far back as Frörup; in the same way the two battalions of the Hessian regiment were detached in the bottom of the Treene ravine.

But I do not wish to weary you with too many examples. I prefer to finish with the following assertion : The attempt to detach infantry for the purpose of attacking an enemy's flank has never been successfully made in war when these troops have been obliged to execute the flank march in sight of the enemy and within the zone of his effective fire.

If my proposition does not seem to you sound, I beg of you to cite a single instance from modern military history where an attack made under these conditions has succeeded.

And yet we very often see movements executed in this manner at brigade exercises. Should we not rather forbid them and employ this valuable time in evolutions less artificial and more practicable in war ?

Military Notes.

A STUDY OF THE EFFECTS OF THE GERMAN TORPEDO SHELL.*

Translated by 1st Lieut. T. C. PATTERSON, 1st Artillery.

EMPLOYMENT against troops under cover :—The torpedo shell is used with a time fuse. (These have been replaced by combination fuses.) The range is first determined with the greatest possible exactness by means of percussion shell. Proceeding then to time firing, the elevation and the fuse are so regulated that the burst will occur at a mean height of from 10 to 15 metres according to the range and at a very short distance in front of the target. Under these conditions, the point of fall of the mean trajectory would be from 50 to 75 metres behind the empulment.

The torpedo shell is not employed against other targets unless in exceptional cases. It may be used at distances greater than those at which the construction of their fuses permits the employment of shrapnel. The torpedo shell is much more effective under these circumstances than those charged with ordinary powder, the action of the latter being almost *nil* at very long ranges. Further it may be useful as a time projectile when the nature of the ground does not favor percussion shell.

The employment of the torpedo shell against moving objects is limited to the single case of a battery, having these shell, when suddenly and unexpectedly attacked. They may then be employed as percussion shell.

To obtain the range in firing at a line of works, recourse is had in the first instance to a shell charged with black powder. For the torpedo shell on burst produces but a small puff of very dark colored smoke making the point of striking difficult to see. But the range of this shell is less by from 10 to 20 metres, according to the distance, than the common shell and thus causes considerable difficulty in determining the range.

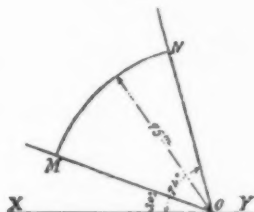
Effect of the torpedo shell :—The bursting charge imparts to the fragments a velocity of about 500 metres. It results from this that the fragments of the ogive and those of the base are projected tangent to the trajectory, the former forward with a very high velocity and the latter backward with a velocity equal to the difference between 500 metres and the remaining

* A summary of the articles on the effects of the torpedo shell from the *Revue d'Artillerie*, by Major Silvestre of the French Artillery.

the mean trajectory passes through C, the middle point of the line AB. The point of fall of this trajectory in the horizontal plane through O is, in round numbers, 50 metres in rear of O. Since the probable variation of the points of burst is 18 metres, 50 per cent. of the bursts will occur between the lines $\sigma\beta$, $\sigma'\beta'$, 18 metres distant from the mean point C, and the diagram shows that 40 per cent. of the bursts will be effective. This is the maximum efficacy obtainable.

Continuing this study under various hypotheses as to errors in aiming, etc., we may obtain a fair idea of the efficacy of the fire, but it is possible to deduce by a general method the value of the firing with this shell.

The fragments of the cylindrical part are generally very small and irregular in shape so that their *vis viva* is rapidly lost. But since their velocity is about 575 metres it will readily be seen that they are effective within a radius of 75 metres.

Fig. 2^a

With O as a centre and with a radius of 75 metres describe an arc of a circle. The sector MON whose area is nearly 2500 square metres makes a part of a right section of a cylinder whose elements are parallel to the crest of the parapet and limits the zone of effective bursts. The volume of this cylinder is sufficiently great because it is not difficult to explode a shell within it, and because if it be impossible to regulate the elevation under favorable conditions we may still by progressive shots obtain a good number of hits.

We have not spoken of the width of the "sheaf" along the parapet. This varies with the height at which the explosion occurs, but, in any case, is small.

The fragments are distributed in a space comprised between two cones; the angle which the elements of the first cone make with its own axis being, for a range of 2500 metres, about 65° , while that of the inner, for the same range, is somewhat less. The "sheaf" will then attain the line of troops between two points whose distance apart varies, with the height of the burst, along a width of from two to at most six metres. Nevertheless it cannot be denied that fire of this kind would cause the speedy abandonment of the epaulment under the conditions stated. By extending the foregoing study it may safely be asserted that the torpedo shell will assure the early abandonment of trenches and field works on the battle-field.

Consequences of the adoption of the torpedo shell:—It is beyond doubt

that the progress in artillery and infantry armament will oblige troops to direct their efforts toward diminishing the effect of the enemy's fire by taking advantage of natural cover and by intrenching. In most armies of to-day the principles developed in France before 1870 are applied. At that time the rifle issued to the French army was much superior to that of other nations—these latter intrenched extensively during their grand manœuvres. There is little probability of a battle occurring in the future without its being preceded by the attack of artificially intrenched positions.

Many military writers, seeking means to reinforce the attack by artillery, have advocated the adoption of curved fire for field artillery. Would it not seem that the adoption of the torpedo shell has solved the problem?

General von Sauer of the Bavarian artillery in a conference with the officers of the garrison of Ingolstadt on March 24, 1890, referred to the impracticability of using shell charged with high explosives which would give, on burst, fragments striking with high angles of fall. But we know that while this very conference was going on the problem was being successfully worked out by the German artillery. Further, the piece of the smallest calibre considered at the present time as adapted to this curved fire is that of 12cm. whose projectile weighs no less than 16kg (32.2 lbs.). The number of rounds that can be transported on the battle-field would hence be very limited, and in order to have in readiness sufficient ammunition for the preparation for direct attack, it would be necessary to keep these pieces in reserve and unemployed during the greater part of the action. Could they then always be brought up at the proper time to the point which the phases of the battle indicate as the most favorable for their employment? It is rather to be expected that the brief opportunity for their successful use would have fled.

These considerations show why the idea proposed by certain writers of adding these pieces to the ordinary armament of a field battery cannot be adopted by an army operating in the field.

On the other hand if, at the beginning of the action, batteries can be in position and supplied with torpedo shell ready to open fire without delay against troops behind improvised or natural cover, this fire will suffice for all the phases of the combat in field warfare.—*Revista di Artiglieria e Genio*.

MANNLICHER BULLETS IN SURGICAL CASES.*

Dr. Enrique Deformes, of the Chilean Hospital of San Juan de Dios, has supplied the *Herald* with his observations on the effects of the Mannlicher bullet upon the human subject.

In comparison with the total number of wounded soldiers, the proportion mortally injured by bullets from the Mannlicher rifle was very small. The major portion of the invalids suffered from severe wounds received from projectiles utilized in the Grasse, Comblain and Colt's rifles, with which both the opposition and dictatorial troops were armed.

"I have divided the category of wounded that came under my charge."

* Valparaiso, Chili, December 15, 1891.

says Dr. Deformes, "into two classes: first, those consisting of flesh wounds; second, fractures and injuries to the bones.

FLESH WOUNDS.

"*First Category.*—The orifice made by the Mannlicher bullet is extremely small. All the entrances were perfectly round and the edges not jagged. In most cases the wounds were in a measure so insignificant that any exploration by means of the finger or small probes or pincers was impossible. Similar conditions prevailed with regard to the exits, the same form of regularity prevailing. Then, too, the cicatrix is absolutely clean and does not leave any unsightly scar. The trajectory line of the bullet is so perfect, its clean passage so pronounced, that after striking a person not the least trace of cloth or any foreign material remains in the wound to impede its healing otherwise than by first intention.

"But the gravest flesh wounds that claimed my attention were cases where the bullet entered the thorax. I have noted three cases of this class, where the bullet traversed the chest, one case of rib fracture and another that passed through without breaking any bone. In these cases there were no complications, except in one—a slight pulmonary hemorrhage—while a marked absence of any pus formation was noteworthy. So long as cleanliness combined with the use of antiseptics was observed no indications of inflammatory symptoms were noted.

"Not many subjects were observed in which bullets had remained imbedded under the skin or under the muscular tissues, but even in these cases the peculiar form of the Mannlicher projectile was easily recognized and with equal facility it was removed. Dr. Vianco's case, to be recorded, is one where the projectile penetrated the posterior wall of the thorax in a line with the eighth intercostal space, slightly abrading the edge of the ninth rib. At the wall of the eighth articulation external palpation revealed that the bullet was lying under the subjacent muscles. It was intended to extract the bullet, but owing to the excessive mobility and pressure caused by finger examination the exploration was abandoned. This abandonment was due to the facts above noted, as it was feared should any such manipulations be continued the bullet might fall into the abdominal cavity and endanger the life of the patient.

"Nearly all others wounded in the abdomen have nothing particularly characteristic to be indicated, but I have seen among these, cases where the patient has succumbed to the shock, or to hemorrhage or peritonitis. Even in these subjects the sufferings of the wounded are far less than if the injury had been inflicted by bullets from other than Mannlicher rifles. In fine, I am led to conclude that the flesh wounds caused may in a large percentage be classed as in no wise serious with proper care, unless in very grave cases of hemorrhage of an artery or vein, or peritonitis.

FRACTURES.

"*Second.*—Those wounded in the bony portion of the body. The action of the Mannlicher bullet upon the bone is a subject of important study for surgeons. My personal observations were, owing to my other pursuits, very unsatisfactory, but from details furnished by Dr. Rivera, chief of the military hospital, I am able to give the following brief data: In no cases did the

outer steel covering leave the interior lead-lining in the passage of the bullet through the bone.

"In one instance the bullet had struck the rifle of a man in the front rank, and after perforating the body passed into the person of the rear soldier, striking a bone and shattering it slightly. This is the case of deformity observed. I have two bullets that present deformation. One struck the femur, the other the tibia, producing fractures of both these bones.

"After seeing these projectiles I comprehended that those who received flesh wounds experienced no deformity, inasmuch as wherever no obstruction of an extremely hard nature was encountered by these bullets a clean, perfect hole was met with. Smoothness is ever present in these bone wounds, the fracture is regular, the splinters and disturbance of the laminae are visibly small and comparatively insignificant.

"In the case of Sub-Lieutenant Chuecas (of the Balmaceda forces) the bullet traversed the superior maxillary. The only infirmity caused by this perforation was slight hemorrhage which was quickly subdued, and the wound promptly and speedily healed.

"Case of Captain Gibs—Ball penetrated on a level facing at an angle of the left eye cavity, perforating the ethmoidal cells. In this case the cure was prompt. No noticeable delay in cicatrizing, a slight paralysis of the pharynx and a very small impediment in the nasal and vocal organs characterized this case.

"The fractures of large bones were numerous. It has been said that taking into account the velocity and composition of the projectile that the simple perforations of the small bones are more frequent. Experience shows that these cases have not been very frequent, the only cases observed being perforations of the tibia.

"Fractures of the large bones are more frequent from the Mannlicher bullet than from other rifle projectiles. A soldier of the Limache Battalion received a wound, fracturing the humerus. This is a rare case where a hard body struck against another of similar character, and yet elastic, producing a great destruction to a soft body, such as lead. In this particular instance the steel covering left the interior lead of the bullet.

"In the military hospital of San Augustin to-day no patients remain that received wounds from the Mannlicher bullet, while there are 300 yet under treatment for wounds inflicted by other projectiles, many of these men retaining permanent or temporary disabilities. In conclusion I will say:—

"*First*—That flesh wounds are simple, curable with facility.

"*Second*—Similar conditions prevail in those who have received fractures of the smaller bones.

"*Third*—While the fractures sustained of the large bones are larger in size than inflicted by other projectiles, so long as proper antiseptic means are utilized, with equal cleanliness, these same fractures are of easier treatment.

"*Fourth*—These beneficial effects are, in my opinion, due to the composition and construction of the Mannlicher bullet.

"*Fifth*—For the reasons stated I believe that the Mannlicher bullet in a humane point of view, is superior to any other bullet used in warfare."—*N. Y. Herald.*

FROM THE ROYAL ENGINEERS JOURNAL, NOVEMBER 2, 1891.
NOTICE OF ARTICLES IN "MEMORIAL DE ARTILLERIA,"
JUNE, JULY, AND AUGUST, 1891. BY LIEUT. P. ASH-
WORTH, ROYAL ENGINEERS.

Coast Batteries in Peace and War.—A commandant of each battery should be appointed in peace time, who will make himself acquainted with every detail of his command, and make all necessary dispositions for war time. He will see that all stores are kept in perfect condition; he will study the chart of the water his battery commands, and should be able to find an enemy's range by cross bearings. When relations with a Foreign Power become strained, and war appears imminent, the following preparations must be made at once:

Look-out post for commandant—

(a) Emplacement for battery telescope.

(b) Adjustment of breech-blocks.

System of transmitting orders—

(a) The battery telescope has a micrometer arrangement similar to a subtense theodolite. It can be used as a depression range-finder in high batteries, and in low batteries it will give the range of a ship at once if the height of any vertical dimension (such as mast-head, tops, or funnels) be known. This instrument is very useful if there is no position-finding station attached to the battery.

(b) The breech-blocks of guns in French coast batteries are generally kept in store in the batteries. On receiving the order to mobilize, the commandant will see that matériel and personnel are ready.

The latter will probably consist of one N. C. O., three or four artillery recruits per gun, the remainder of his detachments being totally uninstructed infantry. These must be put in the least important positions. After a time reserve men will come in, and the batteries will be fully armed and equipped.

When the enemy is sighted, the commandant must try to obtain some vertical dimension of each ship (from a position-finding station if there is one), and give each ship as she is made out a distinguishing number.

The forms of attack by a fleet are:

1. *Blockade.*—Batteries have little or nothing to do, unless the ships come in by night to bombard.

2. *Bombardment.*—The outer batteries may have ships continually within range. The only fire they are likely to come under is shrapnel from the ships' light guns. The batteries should avoid desultory firing and make the most of every good chance.

3. *Systematic attack.*—Is seldom likely to be undertaken. The fleet will probably run past the advanced batteries at speed, and engage the main batteries. Low batteries (which in most French ports line the entrance to the harbor) will suffer a good deal from small-arm and machine-gun fire. They will have to bear the brunt of the attack, as the mine-fields and obstacles will be under their guns. The only part the advanced batteries can play is to pour as heavy a fire as possible into the enemy as he runs past them. The system of indirect laying—by which every gun is kept always

loaded and laid on the centre of the fairway—will often enable these batteries to make a hit as the enemy runs past, either by day or night.

The question as to whether the main batteries should open fire as soon as the enemy is within range, or wait until he closes on them, is open to debate. Our author is of opinion that you should fire whenever you have a fair chance of hitting.

4. *Surprise.*—This method of attack will doubtless be much used in future, and will probably take the form of a night attack, *except in case of an attack before declaration of war*, an eventuality worth considering. By night the batteries will suffer little from the enemy's fire, while the ships lit up by search lights will be good targets. An attempt to carry the batteries by landing parties is very probable, and must be guarded against. It is very necessary to have some batteries (especially of rifled mortars) which will fire on the inner harbor and annoy the enemy after he has succeeded in forcing the entrance.

General observations.—The presence of coast defense ships or torpedo boats will largely assist the defense, and will probably draw the enemy's fire from the batteries, which must profit by the occasion.

Scientific methods of range and position finding, such as the Déport apparatus, will probably be found too complicated for use in the confusion of a close action, when ships are approaching, retiring, and crossing at varying angles and varying speed.

The great principle of fighting a coast battery is never to allow a chance, often unexpected and nearly always fleeting, of delivering an effective fire to slip. Directly the commandant finds an enemy's ship within range he should open fire at once. The only lost shots are those left in the magazines; every round fired, if it doesn't hit the target, will help to correct the range.

Note.—The use of submarine mines and other obstacles in the defense of harbors, and their effect in delaying the enemy under fire, does not seem to be considered at all in this article.

Reviews and Exchanges.

Drill Regulations for Street Riot Duty.*

IN a neat little pamphlet of about fifty pages, Brigadier-General Albert Ordway, Commanding the District of Columbia Militia, publishes a brief plan for a street formation of infantry in case of riot, and follows it with his lecture on Street Riots, which is number 13, and last of a series read to the District Militia by officers of the army and the district early in 1891. He modestly says that he claims no originality for his street-drill, but he must have gratification in knowing that it was substantially adopted by the Tactical Board, who, by the way, did not improve it when they injected it with the absurd interval between the men, which shows a striking instance of the weakness of their system, where, if anywhere, the men ought to stand shoulder to shoulder, and will probably so stand, if ever called upon to meet a mob, drill-book to the contrary notwithstanding.

Be this as it may, however, the prescriptions of the drill-book, are, after all, mere matters of detail, and should only be regarded by intelligent officers as convenient methods of practice in drill, to be modified as occasion may demand when the strain of real service comes; otherwise they are calculated to cramp the movements and functions of troops; and any officer, who, in the presence of a mob rigidly adheres to his book, and to his book alone, will surely come to grief. Consequently General Ordway has done well to couple his lecture with his drill regulations, in order that he may indicate, as he forcibly does, the necessity for the exercise of the greatest quality a good soldier can have—common sense.

It is a good thing for the country when an officer of General Ordway's ripe experience retains his vigor and his interest, and can use his pen as well as his sword. He is entitled to the highest praise for the public spirit that led him to organize the series of lectures enjoyed by the District Militia, and the officers who were associated with him in the course should share his praise. The book in which all are published forms a very valuable addition to our military literature and should be widely read by citizen soldiers. Nor will the officers of our regular army waste any time they may devote to the same purpose. Year by year the two services are becoming more closely knit together. The political support which the militia can and does give to the army must be as fully recognized by the army as the military support which the army may in turn give to the militia. What concerns one, concerns the other, and in no sense more closely than in the circumstances where both may be called upon to act together in time of general peace where local disturbances may need instant action.

While the regular officer is studying his profession in its broader lights, it is only natural that the militia officer should ponder more or less upon the conditions of a narrower field wherein he may be called upon to show his skill and manhood; when

* *Drill Regulations for Street Riot Duty.* By Brig.-Gen. Albert Ordway, District of Columbia Militia. James J. Chapman, Washington, D. C.

the regular is summoned for a similar duty, the two classes meet upon a close equality with the militia-man perhaps a trifle ahead.

It has been wittily said that an officer who does not do his duty in the face of a mob will be cashiered, and if he does his duty he will be hung. Therefore it is no easy task to frame a code of instructions that shall cover a situation to which this criticism applies with a deal more of truth than poetry. General Ordway has carefully presented the horns of this dilemma and has pointed out with equal care the safe and legal way to move between them.

Soldiers should not be called out to treat mobs, until mobs need soldiers' medicine. Till the medicine must be administered, the soldier should stand ready in his barracks or his armory, like the bottle of sure but dangerous specific on the druggist's shelf to be used as a last resort. In ordinary cases it is enough to know that the last resort is ready. The police can handle ordinary cases, and will handle them with confidence if the soldier stands ready. This is the moral effect of the militia for which the tax-payer gives his money. General Ordway, in recognition of this has done well to give his command the information contained in his lecture. Space does not here permit an extended and merited review of it. But this may be said. It is worthy of notice for the enemies it has made. It stirred up a storm of cheap demagogic abuse from certain labor agitators, and this fact at once recommended it to thoughtful, law-abiding men. Its language is clear, its progression is logical, and, on the whole, it steers clear of dangerous information to mobs. In this respect its restraint is wise and in striking contrast to some of the able and fascinating, but dangerous treatises on riots in cities which contain parts that were better kept in manuscript or passed orally to the proper officers, than put in cold type to convey devilish ideas to the fiends of anarchy.

THOS. F. EDMANDS.

Bvt. Col. U. S. Volunteers.

The National Guard in Service.*

This useful little book is composed of a series of lectures by prominent military men, arranged by General Ordway of the District of Columbia National Guard, and delivered before the members of that organization during the past few months. The theory of the book is that the troops of the various States have been called into national service, and the manner in which the call is answered and the service rendered, are taken up and discussed in proper order. Other matter is added, as an appendix to the regular course, on military law, riot duty and the like, the whole making a book that ought to be in the hands of every National Guardsman.

The same amount of information is contained in no other book, as far as we know, since those precious little books (*The Company Clerk and Customs of Service*) of General Kautz have gone out of print. Why cannot these books, by the way, be republished, and brought up to date? No officer of State troops could afford to be without them. But until that happy day comes, if it ever does, the *National Guard in Service* should be in the hands of all officers of State troops.

Of course, it is an impossibility to make an unexceptionable book, and this one is no exception to the rule. In the present case, however, the sins of omission are the most prominent. The original plan is methodically carried out. But what would add much to the value of the book would be a little more on court-martial proceedings, more particularly with reference to the origin of charges and creation of courts. There are manuals devoted to this subject, notably that of Captain Murray, but they

* *The National Guard in Service*. Edited by Brig.-Gen. Albert Ordway, Washington, D. C. Published by James J. Chapman, Washington, D. C. pp. 342. Price \$1.50.

are all defective in the above particulars, from the assumption of too much information on the part of the semi-professional reader.

The lecturers contributing to the book before us, Captain Chase, 3d Art., Baird, 6th Cav., Lieut. Scriven, Signal Corps, Maj. Carpenter, 5th Cav., Col. Haines, Corps of Eng., Maj. Davis, Judge Advocate, together with Gen. Ordway, Maj. Henderson, Surg.-Gen. D. C. N. G., Maj. Pollard, I. S. A. P., same service, and Lieut. Finley, Signal Corps U. S. A.—have laid all National Guard officers under obligations.

JAMES G. GILCHRIST,

Col. 3d Regt., N. G. Iowa.

The Principles of Strategy.*

The grand principles of strategy remain always the same, it is only the special applications that give variety to the theme. The work before us acquires its interest from the freshness and the novelty of these applications. It is a handsome quarto volume, printed in large, clear type, and illustrated with many diagrams and with a number of maps sufficient to satisfy the most exacting,—a supply so generous it is always a pleasure to see in any work relating to the art of war.

The author has set for himself the task of formulating the principles of strategy and illustrating them by examples taken mainly from our own wars. This is certainly a commendable undertaking. The literature relating to our wars has been largely narrative in character; but few attempts have been made to show how the principles of strategy were applied, or to deduce new ideas in regard to either tactics or strategy from the separate campaigns; no one has written the tactical deductions of our last war. Therefore, every effort in this direction has a peculiar interest.

The campaigns treated at considerable length and in more or less detail are the Atlanta campaign, the British operation in Georgia, the Carolinas and Virginia in 1776-1781, and the Vicksburg campaign in 1863; those merely outlined are the Second Bull Run campaign, the Gettysburg campaign and Jackson's Valley campaign; others are used in illustration of particular points.

Besides the praiseworthy attempt to use those campaigns of our own wars of importance as illustrating the guiding principles of the art of war, the author has added another novelty, quite as important, in the introduction of examples from our frontier Indian wars.

The style of the writing is easy and fluent and generally clear; in the theoretical part the propositions are stated with simplicity, and exactness and discussed, in general, with force and animation; while the narrative part has been selected with judgment and is told with interest.

It is to be regretted, however, that with such high aims, with such good judgment in the selection of historical material, with the qualities for accurate and careful investigation and recording of details he is known to possess (illustrated in his work on "Mars-la-Tour and Gravelotte"), the author should have allowed himself to go into the intricate and useless discussions in Chapter V. Indeed, throughout the parts relating to the discussion of principles, the author has a tendency to depart at times from his simple style to become involved in obscure language, to enter into unnecessary refinements or to apply mathematics where they have no proper application.

For instance, on page 11, it is very difficult to determine just what the author is endeavoring to say:

"Briefly defined, then, an army is the highest organic form of military power. Why not say fighting power? Because fighting power is not necessarily military

The Principles of Strategy. By John Bigelow, Jr., 1st Lieut. 10th Cavalry. New York: G. P. Putnam's Sons. 1891.

power. In all but military combats an express or tacit agreement or the necessities of the case prevent the combatants from using the best means to their end. It is only the soldier who fights with the best weapon that human art and ingenuity can produce or procure for him whose fighting power is of the highest order. Military power may be defined as the highest order of fighting power."

And, again, on p. 13 :

"Inasmuch as there cannot be a fight unless one side or the other attacks, the relative defensive strength of the two opposing combatants cannot practically concern them ; but as there may be one in which both sides attack, their relative offensive strength may more or less concern them, according to the probabilities of such a case."

Occasionally statements are made and illustrations given, which by their too great simplicity defeat the object in view. Thus, the illustration of the spherical iron-clads on pages twelve and thirteen is entirely unnecessary, indeed, a mere statement in simple language would have been quite sufficient, since the subject-matter requires no long discussion ; and the point illustrated in figure 9 is mathematically self-evident and practically can never arise as a real case.

At other times much superfluous material is introduced. It is so with all the illustrations in chapter V ; they are entirely superfluous, have no practical value and as demonstrations (even had the discussions any value) would be useless, because they are loosely stated, complicated in method and unnecessarily difficult. The points established by figure 22, and several others, for example, could be made clear in a much simpler way by means to circles tangent internally. (Davies' Legendre, Book III, Prop. XIV.)

Sometimes the other extreme is reached, as when assertions are made which need further explanation to make their meaning clear.

Thus, on p. 36 :

"Obstacles that narrow the marching front of an army, so long as they do not decrease the number, and thus increase the length of the columns, increase rather than decrease the rate of marching."

Again, p. 57 :

"But suppose the army on the march to be formed in a single column. Its length including the trains, may be taken at about one and a half day's march, or about twenty-four miles."

What is meant by "the army" here ? Much seems to depend on that.

And on p. 87 :

"A force thus employed is designated as a pivot of manœuvre."

It is so called not because it is *detached*, but because it happens to be just what it is called.

The attempt to distinguish between forts and fortresses (quite obsolete now), and between kinds of strategy, seems but an effort to make distinctions where there are no real differences, and the definition of strategy proper appears inadequate.

In one or two instances the illustrations given have no bearing on the point they are intended to elucidate.

Thus, on pp. 56-57, the detachment by Grant of Sherman's corps is not applicable to the case because it fulfilled its mission remarkably well, since it kept Pemberton in doubt as to Grant's intentions for a sufficiently long time at a critical moment, and was not too late to join Grant in his general advance, and did not delay that advance.

Besides a number of minor typographical errors, particularly in names, there is one that gives rather an odd reading to an important quotation : on page 49 the quotation from Wolseley is taken, we presume, from the Soldier's Pocket Book, page 463, line 5,

et seq., which reads "including their proportion of guns and matériel," not, as the text has it, "with their proportion of guns and bayonets."

It is also a little misleading, in Chapter IV., to find deserts, mountains, forests, inland seas and lakes, swamps and marshes and rivers, all discussed under the heading "The Ocean Barrier."

The most interesting features of the work are the manner of illustrating the Vicksburg campaign by a series of maps showing the consecutive positions of the troops, at short intervals of time, throughout the campaign, the account of the Geronimo Campaign in 1886, the cruise of the *Alabama* and the British operations in our Southern Colonies in the Revolution. This last is very entertaining reading, and will be perused with particular interest by those who have read Fiske's charming account of the American Revolution.

The book, as a work on strategy, is incomplete, and, indeed, there seems to be no good reason for the appearance of a new work on strategy at this time. But, as a work illustrating and explaining the strategy of our wars it supplies a want and has an important place. The main object seems to have been to discuss our campaigns from the point of view of strategy, introducing only such of the principles of strategy as are essential to their explanation, thus giving to the whole that element of completeness so agreeable to the general reader.

JOHN P. WISSER,

1st Lieut. 1st Arty.

The Electric Motor and its Applications.*

This work embraces a comprehensive treatise upon the theoretical considerations and practical applications of the electric motor. Its value can only be justly appreciated by a careful perusal of its pages.

The practical development of the electrical transmission of power, so often seen in this age of progress makes a study of the electric motor one of universal interest.

In the first chapter of this work are cited all those elementary considerations, necessary to a thorough understanding of the subject matter that follows. The action of the voltaic battery in decomposing acidulated water; the influence of the electric current upon the magnetic needle, and the peculiar positions taken by iron filings placed in a plane perpendicular to a wire conveying an electric current are all described together with the discoveries and experiments of Sir Humphry Davy, Oersted, Arago, Sturgeon, Barlow, Faraday, Jacobi and Morley. The author then describes how the dynamo and motor are the converse of each other, yet interchangeable to a degree, and then gives a résumé on the efficiency of the motor, discussing those conditions necessary to be fulfilled in order to make it a more perfect machine.

In the second chapter are recited the early experiments with motors in Europe, giving to each its proper space. Prominent among those men who are mentioned are: Barlow, 1834-1838; Robert Davidson, 1838-1839; Elias, 1842; M. Froment, 1845; Count Du Moncel, 1851 and Pacinotti, 1861. Many other names are given, such as Wheatstone, McGawley, Gaiffe, Larmenjeat, Roux and Hjorth. "The descriptions above," say the authors, "will serve to show the state of the art as regards electric motors down to the time when the reversibility of the dynamo electric machinery gave an entirely new direction to the efforts of inventive genius in Europe."

In the third chapter are described the early motors and experiments in America, and right here something quite new and interesting is to be found since previous publications have had little to say about American work in this field. Among the early inven-

* *The Electric Motor and its Applications.* By T. C. Martin and Joseph Wetzler. Third Edition—with an Appendix on The Development of the Electric Motor Since 1888, by Dr. Louis Bell. Published by the W. J. Johnston Company, New York.

tors and experimenters comprehensively cited in this chapter are Thomas Davenport of Vermont, 1837; Nelson Walkly, 1838; Solomon Stimpson, 1838; Freeman Cook, New York, 1840; John H. Lillie, Illinois, 1850; Jacob Neff, Pennsylvania, 1851; Thomas C. Avery, New York, 1851; John S. Gustin, New Jersey, 1852; Prof. G. C. Page, Smithsonian Institute, 1852; Moses G. Farmer, 1847; Thomas Hall, Boston, 1851; Louis Stein, 1854; Maurice Vergnes, 1864; Yeiser, 1858; Lewis H. McCulloch, 1867; Charles J. B. Gaume, Iowa, 1867; W. Wickersham, 1868; Chas. T. Mason and A. J. B. Morat; bringing the subject down to 1885.

The descriptions of these early apparatus are very interesting and given in a clear and concise manner, showing to what a satisfactory stage of development this important subject was brought by American inventors.

It is not necessary, nor possible in this review to enter into the details of the subject matter in the fourth chapter further than to say that here is found an excellent discussion of the electrical transmission of power and a description of the progress made in the development of this great principle which, at the present day, is so widely exemplified all around us.

One of the practical applications of this principle, which is generally universal comes to us in the electric railway system, and the fifth chapter treats of its development in Europe. This taken in connection with the sixth chapter, relative to the electric railway in America, presents a most interesting résumé of what has been accomplished in this field. The text matter, accompanied by many excellent diagrams, treats the subject in a way which at once attracts the reader's attention to the great care and thought given to it by the authors.

The use of storage batteries with electric motors for street railways is treated in a most interesting and instructive manner in the seventh chapter. This system must be thoroughly understood in order to appreciate its merits, and in order to form a comparison between it and other systems. This the reader is enabled to do by the comprehensive and clear discussions of the factors to be considered, from which the inventor may form his ideas of design and the capitalist his of investment.

These considerations are then followed by descriptions of storage battery systems used in various parts of the world, together with a record of many experiments made with the view of determining their comparative merits.

Although one of the most important applications of the motor is in driving the street car, or, more generally, the rail car, there are many other uses to which it is put, and in the eighth chapter are described the industrial applications of electric motors in Europe. According to the object in view the power must be regulated both for the sake of practicability and economy. A fund of information is given on these matters. The different designs intended for the various industries, whether the sewing machine, the fan or the rock-drill, embrace those of Jablochkoff, Deprez, Estève, Trouvé, Reckenzaun, Gramme, Lee-Chaster, Ayrton-Perry and others.

The same subject is pursued in the ninth chapter, but the field is transferred to America where the numerous applications of the electric motor to industrial purposes are well known. The advantages claimed for this source of power, viz.: freedom from dust, smoke, steam and noise; its controllability by means of a key or switch whereby its use can be regulated at any moment, are all worthy of serious attention. The electric motor has already gained for itself, both in this country and abroad, a popularity which is ever increasing, and the experiences of the past and present point to its almost universal use in the future. Prominent mention is given to the motors of Griscom, Daft, Van Depoele, Diehl, Keegan and Pendleton.

A brief description of the use of electric motors in marine and aerial navigation follows in the tenth chapter.

Although such applications are, as yet, in an imperfectly developed condition, the possibilities for the future are great, and it is interesting to note the progress already made. Several electric launches are described together with the motor balloons of Tissandier and Krebs-Renard.

In the eleventh chapter a new departure is treated in a very instructive manner. This is telerage, and as stated in the work, "a teler line system consists of a rod or rail track of considerable length, suspended several feet from the ground, connected with a source of electricity placed at some suitable and convenient place, at or near the course of the track, and traversed by an electro-locomotive which derives its motive power from the said track, draws a number of small holders of freight or passengers, and is controlled as to its motion, from a place or places other than itself."

Illustrated by numerous diagrams and filled with interesting reading matter, this chapter proves most entertaining and instructive.

Among the telerage systems mentioned are those at Glynde, England; Weston, England, and several others proposed and designed for various purposes.

The twelfth and thirteenth chapters, supplementary to the seventh and ninth, treat of the latest American motors and motor systems in a thoroughly comprehensive manner. The great activity of American inventors places them well in the fore, and the two chapters devoted to a description of their work are but justly due to their untiring energy. The illustrations are clear, the descriptions comprehensive, and the discussions exhaustive on this great latter-day work. It will only be possible here to mention the names of those whose efforts in the motor field are described, viz.: Stockwell, Beattie, Brush, Sprague, Henry, Higham, Van Depoele, Field, Schlesinger, Edgerton, Fisher, Bentley-Knight, Thomson-Houston, Field, Short, Julien, Baxter, Lugo, Patten, Hochhausen, Hyer, Thone, Card and Diehl.

Europeans have not been backward in inventive genius, and in the fourteenth chapter is given a comprehensive treatise on their latest motors and motor systems. Among those mentioned are Pollak and Binswarger, Immisch and Brown.

The fifteenth chapter discusses the subject of alternating current motors. Here is found a carefully outlined description of their inception and the subsequent progress made in their development. Wilde's experiments of 1868, Dr. Hopkinson's and Prof. Adam's investigations together with those of Prof. Elihu Thomson, the theories and discussions of Dr. Louis Duncan, and the work of Mr. Field, are all treated entertainingly and instructively.

In the sixteenth chapter there is given a very clear description of the thermo-magnetic motor and its principle, viz.: the alternate heating to redness and cooling a magnetic bar of iron producing an electric current in a neighboring wire, and a description of some of the types devised and used.

McGee, Schwedoff, Edison and Menges have done considerable work in this field. It is as yet incompletely developed. The authors discuss the various obstacles to be overcome, and advantages to be obtained in a way that adds great interest to the subject.

In the appendix to this work, by Dr. Louis Bell, is given the development of the electric motor since 1888. The subject is discussed in a most scholarly manner, and one is struck by the wonderful progress and developments in this field in the space of two short years.

Sprague and Thomson-Houston have invented new, and improved upon old methods. Short, Westinghouse, Rae, Wenstrom, Baxter, Edison, Croker-Wheeler, Ed- dy, Perret and others have brought their inventive genius to a practical development, and have shown the world the pace of progress.

Summing up, there is a vast fund of valuable information to be gained from the

pages of this work. It is wonderful to note the rapid strides which are being made by the use of this grand element of nature—electricity.

As a literary production the work is clear and comprehensive, and well worthy of careful and close study by those who would familiarize themselves with the development of the important theory of the electrical transmission of power.

All credit is due the authors for their most valuable and carefully prepared work.

S. R.

Instructions for Courts-Martial.*

In this pamphlet Lieut. Arthur Murray has placed in small compass an epitome of information regarding rules of courts-martial procedure, the making up the record, together with convenient forms to be used for various phases in courts-martial trials. There is nothing superfluous in it, and the absence of typographical errors attests the care with which it has been prepared by the painstaking compiler. It is a very neatly bound convenient little hand-book, which fact adds to its value.

These instructions are similar to many others that have been issued at various department headquarters during the past five years, though more elaborate than any of them. If we are not mistaken, those now before us are the second set that have been officially adopted in the Department of Dakota within the last three years; but Lieut. Murray's have the advantage of being up to date, or nearly so, in decisions. The pamphlet seems to be the result of a conscientious effort at compilation; originality scarcely appears elsewhere than in arrangement of subject-matter. This is to be regretted; for the compiler has had experience as a Judge Advocate, and his maturer views would have had more weight perhaps, because of his recognized legal acquirements and ability, than will some of the authorities he cites. This is notably the case with the "Digest," so frequently quoted. In order, however, that there should be no misapprehension regarding the "Digest," considered as an authority, G. O. No. 3, A. G. O. 1881, should never be lost sight of. This order states that, by permitting it to be published, the War Department must not be taken to have approved all that was in the Digest; and furthermore, that such opinions as are held to be obligatory upon courts-martial have been and will continue to be formally announced to the army in general orders. It follows, therefore, that, except as to these paragraphs which have been formally so promulgated in general orders, the Digest is not an authority in our army. Yet this distinction, neglect to note which may lead to error, is not always attended to.

The rapid changes now taking place in courts-martial matters leave little that is stable in our military jurisprudence. Lieut. Murray will therefore not be surprised if before the printing of his pamphlet was completed, "decisions" render some part of it obsolete. This cannot be helped; but by carefully noting therein these changes, it is wholly practicable for the officer always to have at hand in the pamphlet under review, a most convenient work of reference in the essentials of courts-martial proceedings. For this Lieut. Murray will receive, as he deserves, the thanks of those interested. We can only hope that he will not stop here, but find it agreeable to pursue the subject still further, as he is so well qualified to do, to his own credit and the benefit of the service. The acting Judge Advocate General has contributed some views on undecided points which adds to the authoritative character of the work.

A. E. B.

* *Instructions for Courts-Martial.* By Lieut. Arthur Murray, First Artillery, U. S. A. Headquarters Department of Dakota, St. Paul, Minn.

The Naphtha Launch.*

We have received a beautifully illustrated descriptive catalogue of the launches and yachts produced by the Gas Engine and Power Co. of Morris Height, New York City.

The Naphtha launches are in use among officers of the Engineer Corps and in the Coast Survey. Their beauty of design, simplicity and cleanliness, and the quickness with which they can get under way, commend them in all cases where launches are in demand.

It would seem as though the principle of the naphtha engine might ultimately find successful application in guard and other boats for harbor defense.

* *The Naphtha Launch.* By the Gas Engine and Power Co. Morris Height, New York City.

RECENT MILITARY ARTICLES OF SPECIAL INTEREST.

Custer's Last Battle. By Captain E. S. Godfrey, 7th U. S. Cavalry. The Century Magazine. January, 1892.

Some Foreign Criticism of the American Civil War. By 1st Lieut. William A. Shunk, 8th U. S. Cavalry. Journal of the Cavalry Association. September, 1891.

The Education of Officers for the Armies of To-day. 1st Lieut. J. P. Wissler, U. S. Artillery. The United Service (Hammersly & Co.). February, 1892.

The New National Guard. By Captain F. V. Greene, late U. S. Eng's. The Century Magazine. February, 1892.

The Connecticut National Guard. By Lieut W. H. C. Bowen, U. S. A. Outing for February.

A Light Cavalry Regiment on Active Service. By Captain F. Maude. Late R. A. Journal of the Royal United Service Institution. December, 1891.

The French Manœuvres—1891. Revue des Deux Mondes. November 15, 1891.

The French Army. Sir Charles Dilke. Fortnightly Review. November, 1891.

Sir Charles Dilke and the French Army. By Captain F. N. Maude, R. E. The United Service Magazine (London). January, 1892.

Memoirs of General de Marbot. Revue des Deux Mondes. November 1, 1891.

Military Criticism and Modern Tactics. The United Service Magazine (London). October, 1891.

The Conveyance of Troops by Railway. By Colonel J. S. Rothwell, R. A. The United Service Magazine (London). December, 1891.

Annual Report—1891.

To the Members of the Military Service Institution of the United States.

GENTLEMEN:

It again becomes my duty, on behalf of the Executive Council, to submit the annual report of the Institution.

During the year 1891, four hundred and ninety new members have joined the Institution,—a greater number than ever before in any one calendar year. The benefit already derived from the removal of the restriction upon the number of associate members, is shown by the fact that 206 of these new members are associates, many of whom are gentlemen of high standing and great influence in the National Guards of their several States, and others conspicuous for their services during the late War, or their attainments in the various pursuits of civil life. The National Guards of thirty-two of the States are now represented upon our roll of associates.

The Treasurer's report for the fiscal year shows: Balance on hand, January 1, 1891, (cash and R. R. bond with premium) \$4,541.73; Received during the year 1891, (cash) \$8,256.19; Expended during the year 1891, (cash) \$7,361.42; Balance on hand, January 1, 1892, (cash and R. R. bond without premium) \$5,417.88; Showing a surplus of receipts over expenditures of (cash) \$894.77.

The recasting of the JOURNAL at the beginning of the year 1889, and the change from a quarterly to a bi-monthly issue have proved wise measures. They were followed not only by a large increase in membership, but by a rapid and unusual increase in

yearly income, as shown by the Treasurer's reports for the years at and since that time :

For the year 1888 this income was \$3,947.05 ; for 1889 it increased to \$5,380.10 ; for 1890 to \$6,752.80 ; and for 1891, as shown above, to \$8,256.19.

The Gold Medal of the Institution for 1891 was awarded to 1st Lieut. HENRY A. REED, 2d U. S. Artillery, for the best essay on " The Terrain in its Relation to Military Operations."

The JOURNAL has profited during the year by the recent great revival of interest in military studies. Much valuable material has been received for publication, and it has been necessary to increase the size of the JOURNAL to furnish the space required for it. The volume of the JOURNAL for 1891, containing as it does 1338 pages, is the largest ever issued, and the quality of its contents will be found to be fully up to the standard set by its predecessors.

The Institution has become of great and manifest benefit to the military service, and especially to those officers of the Army and of the National Guard who have become members. It is believed there is no better medium through which a broad and useful military education can be obtained, and intelligent interest in the national defense disseminated throughout the country.

Very respectfully,

J. M. SCHOFIELD,

Major-General, U. S. A.

President.

EXCHANGES.

BELGIUM.

La Belgique Militaire. The Truth Concerning the Miscalculation in the Forts on the Meuse. Rapid-fire guns. Cavalry equipment. Firing with Reduced Cartridges in the Granadier Regiment.

Revue de L'Armée Belge. Former tactics. Constantinople and the Balkan Peninsular. A Study in Powders and Explosives. Rapid Fire Guns. Concerning our Firing Regulations. A Boat that Can be Taken to Pieces.

ENGLAND.

Proceedings of the Royal Artillery Institution. (December, 1891) The Concentration of Fire from Forts. On the Range Indicator Dial.—The French Manœuvres of 1891. (January, 1892) Naval Attack of Fortifications. Experiences at Okehampton in 1891. A Retrospect of the Equipment, Services, etc., of the 1st and 2d Russian Mountain Batteries in the last War.

Journal of the Royal United Service Institution. (Vol. 36, No. 167) Notes on Organization and Training by a Regimental Officer. Notes on the Attempted Invasion of Ireland by the French in 1796-98. The Naval Schools of the Chief Continental Powers. The Training of the Seaman Personnel in the German Navy. Précis of the Regimental History of the 33d East Prussian Fusiliers in the War of 1870-71.

Aldershot Military Society Papers. Visual Signaling. Combined Military and Naval War Operations.

FRANCE.

Revue Militaire de L'Etranger. The Complement of Officers in the Russian Army. The German Colonial Troops. The School of Application for Artillery and Engineers at Turin. Military News.

Revue du Cercle Militaire. The Franco-Italian Frontier. Military Applications of Electric Light Projectors. Russian Field Mortars. The Reorganization of the Spanish Army. The German Cavalry from an English Point of View.

INDIA.

Journal of the United Service Institution of India. (Vol. 20, No. 87) Smokeless Powders, their Composition and Manufacture. General Zieten's Defense of the Line of the Sambre in 1815. Cavalry Tactics. The Development of Cavalry Training in India. The Russian Manœuvres in Volhynia in September, 1890. (Vol. 20, No. 88) The Reorganization of our Native Infantry. Cavalry Reconnaissance. The Anglo-Russian Question in Central Asia. The Supply of Half-Mounting Equipment to the Native Infantry of the Bengal Army.

ITALY.

Revista di Artiglieria e Genio. (November and December, 1891) Crushing Mills for Grain. Field Guns of the Future. The Angle of Elevation and its Measurement.—Siacci. New and Worn Out Guns. The Stability of Beams Uniformly Loaded, and of Compressible Supports. Continuation of Ballistic Tables.—T. F. P.

UNITED STATES.

- Journal of the U. S. Cavalry Association.* (December, 1891) The Horse. Some Thoughts on Military Setting up and Gymnastic Exercise. Cavalry Raids. The Enlisted Men of the U. S. Army. The Proper Relative Proportions of the Three Branches of the Service. Cavalry Outpost Duty. Letters on Cavalry.
- The United Service.* (February, 1892) The Education of Officers for the Armies of To-day. Romance and Rebellion. For the Best Interests of the Service. Blockade Running.
- The Century.* (January, 1892) Custer's Last Battle. The Alligator Hunters in Louisiana. The Discontent of the Farmer. (February) The New National Guard. Richard Henry Dana. The Regular Army and the National Defense. A National Militia. Recent Discoveries concerning the Gulf Stream.
- The Engineering Magazine.* (February, 1892) The Decline in Railroad Building. The Gold Fields of South Africa. The Wind as a Factor in Geology. Gravity Systems of Water Supply. Government Engineering Defended. Who is an Engineer?
- Harper's Monthly Magazine.* (January, 1892) Canada's Eldorado. Aaron Burr's Conspiracy and Trial. Our Exposition at Chicago. A Fourth Class Appointment. London of Charles the Second. (February) From the Black Forest to the Black Sea. Personal Recollections of Nathaniel Hawthorne.
- The North American Review.* (January, 1892) The Question of the Quorum. French Novels and French Life. Wages in Mexico. The Pardoning Power. The First Cost of Ships. (February) A Claim for American Literature. Fines on Trans-Atlantic Steamers. The Duty and Destiny of England in India. Lotteries and Gambling.
- Outing.* (January, 1892) Cowboy Life. Horseback Sketches. Saddle and Sentiment. The Active Militia of Canada. (February) The St. Bernard Kennels of America. Cowboy Life. Saddle and Sentiment. The Connecticut National Guard.
- The Railroad and Engineering Journal.* (January, 1892) Progress in Flying Machines. The United States Navy. The Trial of American-Made Armor Plate. Foreign Naval Notes. Lake Monitors. (February) English and American Locomotives. The Columbian Exposition. The Sault Ste. Marie Canal Traffic. The United States Navy.
- Transactions of the American Society of Civil Engineers.* (October, 1891) The American Railroad Viaduct. Screw Steamship and Tow Barge Efficiency on the Northwestern Lakes of America. The Proposed Lake Erie and Ohio River Ship Canal. Some Recent Experiments with Dynamite on an Ocean Bar.

ARTICLES ACCEPTED FOR THE JOURNAL.

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- Value of Manœuvres and Kriegspiel,* By LIEUT. C. H. BARTH, 12th U. S. Infantry.
A Plea for the Colors, - - - By CAPT. MOSES HARRIS, 1st Cavalry.
Post Schools in the Army, - - - By LIEUT. J. L. SEHON, 20th U. S. Infantry.



Prize Essay—1892.

I.—The following Resolution of Council is published for the information of all concerned :

Resolved, That a Prize of a Gold Medal of suitable value, together with a Certificate of Life Membership, be offered annually by THE MILITARY SERVICE INSTITUTION OF THE UNITED STATES for the best essay on a military topic of current interest ; the subject to be selected by the Executive Council and the Prize awarded under the following conditions :

1. Competition to be open to all persons eligible to membership.*
2. Each competitor shall send three copies of his Essay in a sealed envelope to the Secretary *on or before October 1, 1892*. The Essay must be strictly anonymous, but the author shall adopt some *nom de plume* and sign the same to the Essay, followed by a figure corresponding with the number of pages of MS.; a sealed envelope bearing the *nom de plume* on the outside, and enclosing full name and address, should accompany the Essay. This envelope to be opened in the presence of the Council after the decision of the Board of Award has been received.
3. The prize shall be awarded upon the recommendation of a Board consisting of three suitable persons chosen by the Executive Council, who will be requested to designate the *Essay deemed worthy of the prize*; and also in their order of merit those deserving of honorable mention.
4. The successful Essay shall be published in the Journal of the Institution and the Essays deemed worthy of honorable mention, shall be read before the Institution, or published, at the discretion of the Council.
5. Essays must not exceed twenty thousand words, or fifty pages of the size and style of the JOURNAL (exclusive of tables).

II.—The Subject selected by the Council at a meeting held Nov. 27, 1891, for the Prize Essay of 1892, is

"THE ARMY ORGANIZATION, BEST ADAPTED TO A
REPUBLICAN FORM OF GOVERNMENT, WHICH
WILL ENSURE AN EFFECTIVE FORCE."

III.—The gentlemen chosen by the Council to constitute the Board of Award for the year 1892, are :—

SENATOR CHARLES F. MANDERSON,
SENATOR REDFIELD PROCTOR,
GENERAL JOHN M. SCHOFIELD, U. S. A.

WM. L. HASKIN,
Secretary.

GOVERNOR'S ISLAND,
November 28, 1891.

*" All officers of the Army and Professors at the Military Academy shall be entitled to membership, *without ballot*, upon payment of the entrance fee. Ex-officers of the Regular Army of good standing and honorable record shall be eligible to full membership of the Institution *by ballot* of the Executive Council.

" Officers of the United States Navy or Marine Corps shall be entitled to membership of the Institution *without ballot*, upon payment of the entrance fee, but shall not be entitled to vote, nor be eligible to office.

" All persons not mentioned in the preceding sections, of honorable record and good standing, shall be eligible to Associate Membership *by a confirmative vote* of two-thirds of the members of the Executive Council present at any meeting. Associate Members shall be entitled to all the benefits of the Institution, including a share in its public discussions, but no Associate Member shall be entitled to vote or be eligible to office."

DR. JAEGER'S
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SYSTEM CO.

HERMANN SCHAEFFER,

President;

ERNEST BENDER,

Vice President.

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These goods are manufactured under the supervision of Dr. Jaeger. Their sanatory virtues are due to their *construction*, and to the *natural, inherent properties* of the animal fibre; they are GUARANTEED to be ALL WOOL of the finest quality; they are *graded to the seasons*, to be worn "all the year round" by both sexes, from birth to old age.

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504, Fulton Street, Brooklyn, N. Y.; 1104, Chestnut Street, Philadelphia, Pa.

An Age of Progress: Cleveland's The Standard.

When Cleveland's Baking Powder was first offered the United States Army in place of the one then used, the Commissary Department, under authority from Washington, Jan. 21, 1891, analyzed and compared both brands. As a result of the analyses, Cleveland's was selected, and since that time has been the baking powder used in the U. S. Army, and every proposal for army supplies specifies that the baking powder must be "equal in quality to Cleveland's."

It is an age of "go ahead" and Cleveland's is up with the age.

In using Cleveland's Baking Powder, remember that on account of its superior strength it takes about one-third less to do the same work.

Announcement.

THE attention of the members of the Institution is called to the fact that at the general meeting to be held on March 11, 1892, the following proposed amendment to the Constitution will be voted upon :

“When any member shall have been dismissed from the Army, Navy, or Marine Corps, by order of the President, or the sentence of a court-martial, or shall have been convicted by a civil court of a felony, his membership shall be forfeited and his name dropped from the rolls of the Institution.”

Members who cannot attend are earnestly requested to send their proxies to the Secretary of the Institution or to some member of the Council.

The Military Service Institution.

President.

Major-General JOHN M. SCHOFIELD, U. S. Army.

Resident Vice-Presidents.

Major-General O. O. HOWARD, U. S. A.

Bvt. Brig.-Gen. T. F. RODENBOUGH, U. S. A.

Secretary.

Major W. L. HASKIN, 1st U. S. Artillery.

Treasurer.

Lieut. J. C. BUSH, 5th U. S. Artillery.

Asst. Secretary and Vice-Treasurer.

Lieut. GUY HOWARD, 15th U. S. Infantry, A. D. C.

Executive Council.

Term ending 1897.

BATES, A. E., Major Pay Dept.
HAMILTON, JOHN, Colonel, U. S. A.
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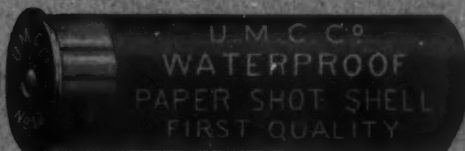
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TENTH REGIMENT OF INFANTRY.

By LIEUT. S. Y. SEVBURN, U. S. A.,

ADJUTANT TENTH INFANTRY.

IN submitting this sketch the author disclaims any attempt to narrate events in what is termed a popular style, but has endeavored to give to those interested a concise history of the Tenth Infantry, accurate in details so far as painstaking work and careful revision can make it. It will be noticed that it does not include the history of the organizations designated as Tenth Infantry which existed for short periods of time in the military history of the country prior to 1855. It would be very gratifying, no doubt, to be able to add to our records the gallant names and deeds of those regiments, but it is a question if their history should properly be included in that of the present organization.

The Tenth Infantry of to-day has a record of which its members may feel sufficiently proud, and it is hoped that some able pen may yet describe in an attractive manner the deeds of heroism, privations and sufferings of its members.

The regiment was organized by Act of Congress approved March 3, 1855, which also established the 9th Infantry, and 1st and 2d (now 4th and 5th) regiments of cavalry, and the following named officers were appointed to the original organization:

Colonel Edmund B. Alexander.

Lieut.-Colonel Charles F. Smith.

Majors: William H. T. Walker and Edward R. S. Canby.

Captains: Henry F. Clarke,* Franklin Gardner,* James G. S. Snelling,* Barnard E. Bee,* John C. Symmes,* Matthew S. Pitcher (N. Y.), Nathaniel S. Webb (Conn.), Albert Tracy (Me.), Jesse A. Gove (N. H.), and John Dunovant (S. C.).

First Lieutenants: Joseph L. Tidball,* Alfred Cumming,* Cuvier Grover,* Louis H. Marshall,* Henry E. Maynadier,* Henry B. Kelly (La.), James Findlay Harrison (Ohio), William Clinton (Penn.), John McNab (Vt.), Nathan A. M. Dudley (Mass.).

Second Lieutenants: Peter T. Swaine,* John H. Forney,* Lyman M. Kellogg,* Lawrence A. Williams,* James Deshler,* William H. Russell (N. J.), Alexander Murry (Penn.), Malcolm H. Nicholls (La.), William Kearny (Mo.), and Curtis Dunham (Kan.).

Captains Clarke and Symmes declined, and 1st Lieutenants A. D. Nelson* and Henry Heth,* 6th Infantry, were appointed to fill their vacancies. John Dunovant was the only captain who had seen no previous service.

The 9th and 10th Regiments of Infantry (riflemen) were uniformed as

* Graduates of the U. S. Military Academy.

other regiments of infantry, with the exception of the knapsack straps and waist belts, which were like those of the French *Chasseurs-à-pied*. They were also furnished with bugles instead of drums.

The headquarters of the regiment were stationed at Carlisle Barracks, Pa., recruiting being conducted under the superintendence of the regimental commander, to whom all officers appointed to the regiment were directed to report by letter, giving their addresses, and suggesting places in their respective neighborhoods where recruiting rendezvous could be opened. For the first few months a field officer other than the colonel was in command of the regiment.

Recruiting rendezvous were established at various points throughout the Middle and New England States, Ohio, Indiana, and Kentucky, and the junior major was designated as "inspector of regimental rendezvous and stations" in April, 1855; Lieutenants McNab and Maynadier being announced at the same time as adjutant and quartermaster respectively.

Colonel Alexander joined and assumed command of the regiment August 25, 1855, relieving Lieutenant-Colonel Smith and continuing the regimental staff in their positions.

To facilitate the necessary military instruction, Companies A, B, D, G, and K were, in August, placed under the supervision of Lieut.-Col. Smith, and C, F, H and I, under that of Major Canby. Hardie's Rifle and Light Infantry Tactics were first used for instruction in the regiment. In September, 1855, preparations were commenced for the transfer of the regiment to its first regular station.

In October Lieutenant McNab was detailed on recruiting service and Lieutenant Maynadier was made regimental adjutant in his place, Lieutenant Swaine, later, being appointed regimental quartermaster in Maynadier's place.

The Field, Staff, and A, B, C, D, F, G, H, I and K, left Carlisle Barracks October 13th, and arrived at Galena October 17th. Headquarters and A, C, D, I and K, travelled thence by steamboat to Fort Snelling, arriving October 20th. Companies B, F, G and H, under Major Canby, left Galena on the 18th and arrived at Fort Crawford, Wis., October 19th. Company C took station at Fort Ripley October 31st.

Of the first five hundred men enlisted for the regiment, sixty-six were born in the New England States, one hundred and forty-nine in the Middle and Western States, and two hundred and eighty-five were foreign born. From this total enlisted, two hundred and seventy-five deserted before completing their enlistment.

Company E during this year was serving in the field under General Harney, a portion of the time being mounted. The seventy men carried on its return for July had all been selected by Captain Heth from the general service recruits at Governor's Island, N. Y. The company, under Lieutenant Dudley, arrived at Fort Leavenworth on the 25th of July. It left that post on the 4th of August, and on the 3d of September was engaged in the battle of Blue Water.

The only changes in the list of officers of the regiment for the year 1855 were due to the death of Captain Snelling and the resignations of Lieuten-

ants Harrison and Kellogg. Aside from the regular promotions so caused, three brevet second lieutenants—Hill of the 10th, Bennett of the 3d, and Bryan of the 9th—were promoted and joined the regiment at the foot of the list of second lieutenants.

In March, 1856, a system of regimental instruction was instituted. Exercise in drill, target practice and marching was zealously kept up. It was impressed on the soldiers that their duties as "Light Infantrymen" required of them a complete knowledge of the use of the rifle, and especially deliberation and calmness in firing, that each shot might be effective. The ranges for target practice were two, three, four, five, six and seven hundred yards. Five shots were allowed at 200 yards, seven at 300, nine at 400, nine at 500, and ten each at 600 and 700 yards. The target used was a piece of white cotton, seven feet long and four feet wide, stretched on an iron frame. The bull's-eye was a circle eight inches in diameter, four feet from the ground and equidistant from the sides, painted black, with the exception of a small spot in the centre left unpainted to determine the centre accurately. Outside the bull's-eye were two black rings concentric with it, with radii of six and nine inches respectively. All shots were recorded and the men classified according to ability. Squads and individuals were practised, and the percentage of hits to misses governed the score, record in the cases of individuals being kept of bull's-eye hits.

Regimental headquarters and four companies, under Colonel Alexander, left Fort Snelling June 24th of this year, and arrived at Fort Ridgely June 30th, taking station there; B, F, G and H left Fort Crawford, Wis., June 9th, and arrived at Fort Snelling June 11th, where H was assigned to duty.

On the 23d of July, B (Gardner) and F (Pitcher) left Camp Alexander, near Fort Snelling, under the command of Lieut.-Col. Smith, on the Red River expedition. They were absent until November 27th of the same year, when the command returned to Fort Snelling, having marched in that time a distance of nearly a thousand miles. Colonel Smith assumed command of Fort Snelling on his return to that post.

On the 19th of March, 1857, it was reported to the commanding officer of Fort Ridgely, that a war party of Sioux had raided a settlement at Spirit Lake on the southern border of Minnesota, killing settlers and burning their homes. The call for assistance came from Des Moines City, described at that time as a settlement on the Des Moines River, some fifteen miles north of Spirit Lake. Captain B. E. Bee with "D," numbering forty-eight rank and file, left the post at noon of the same day and proceeded down the valley of the Minnesota River to South Bend.

The season of the year was most unfavorable for such an expedition. The snow lay deep on the trail, and had thawed to such an extent that it would not bear the weight of the men or the heavy sleds used for transportation. Their progress was necessarily slow and wearisome.

Extricating the mules and sleds from the deep drifts of snow by digging with spade and shovel, and pulling them out of the sloughs, more troublesome than the snow-banks, and more dangerous, occupied the men from early daylight until darkness set in, and greatly delayed the progress of the command. For several days the same difficulties were encountered.

By marching the command in column of fours and relieving the men at the head of the column, at short intervals, they were able to break a road through the deep and heavy snow. They would then stack arms, and the soldiers would fall back to the assistance of the sleds. In spite of these difficulties the command marched fifteen or eighteen miles a day. In addition to the severe strain this labor imposed upon the men, they were, after reaching camp, drilled in skirmishing, as many of them were recruits who had never been instructed in this drill. In spite of their hardships and sufferings the soldiers behaved gallantly, evincing patience, determination and pluck, and maintained a cheerfulness really remarkable.

On the afternoon of March 28th, after a weary march of twenty miles, the command arrived in sight of the Indian village, which was situated in a thick grove of timber and apparently consisted of about thirty lodges. At once all was made ready for action. The sick and weary rejoined the ranks from the sleighs. The advance was made and the old story repeated. The Indians had fled, and only their deserted village and a half-breed Sioux settler, well known to the whites by the name of Caboo, remained to compensate the troops for their gallant effort. From Caboo it was learned that the hostiles were a portion of Ink-pah-du-tah's band. They had wiped out the settlement, and had gone to Heron Lake, some twenty-five miles distant in the direction of the Yankton Country.

Caboo was confident that the Indians were there, although he asserted that they intended to join the Yanktons, who were then at war, and against whom troops were then operating on the Missouri River.

At retreat, Captain Bee, having decided to continue the pursuit, called for volunteers, desiring to select for that purpose the strongest and most ardent of the men, but every man of the company stepped to the front and desired to be permitted to accompany the expedition. Selecting one officer,—Lieutenant Murry,—two non-commissioned officers, and twenty privates, rationed for three days, Captain Bee pushed on to Heron Lake. Caboo, who had joined the command as a guide, by intercepting the trail shortened the distance marched to about fourteen or sixteen miles. The camp was found, but the Indians had become alarmed and fled in haste from their village, leaving behind traces of their plunder in the shape of books, scissors, articles of female apparel, furs, traps, etc., scattered about all parts of the village. They had been gone some hours. About four miles beyond, at another small lake and grove, a small camp of hostiles had also been established, but was deserted when Lieutenant Murry and his men, detached for that purpose, reached it. Fearing that other bands were still about the settlement, and being destitute of provisions, with a rapidly rising stream—the Des Moines—between him and his supplies, and his men being foot-sore and weary from a march of one hundred and forty miles under difficulties not easily portrayed, Captain Bee was obliged to return disappointed to his main camp. The command then marched to the settlements, and an investigation entered into by Captain Bee disclosed the cause of the outbreak to be as follows:

In the early winter Ink-pah-du-tah's band, numbering about thirteen men, had been hunting on the Little Sioux River. A dog belonging to one

of the settlers attacked and severely bit one of these Indians, and was promptly killed by the Indian. The owner of the dog punished the Indian, and the other settlers, fearing trouble from the settler's rash act, made matters still worse, in fact, precipitated upon themselves an Indian war in short order. They disarmed the whole band of Indians, thus leaving them without means of procuring sustenance. The Indians became highly incensed at this act of the whites. The captured arms were left unguarded, a fact the Indians soon discovered. They immediately recovered them, and then turned with true savage fury upon the defenseless settlers of the valley, murdering, burning and carrying into captivity women and children. These Indians procured through the unscrupulousness of a pair of white wretches by the name of Wood, who were brothers, living on the opposite side of the river to the settlement destroyed by the Indians, arms and ammunition. They are said to have carried on a profitable traffic with the hostiles. There appears no record of a subsequent hanging match either.

During April of this year the headquarters of the regiment were temporarily established at Fort Snelling, in consequence of the Indian excitement, and upon the strong recommendation of General Alexander, who earnestly set forth the advantages possessed by that post in having a daily mail in summer, and a tri-weekly mail in winter.

In May one of the white women, captured by Ink-pah-du-tah's band of Sioux at the Spirit Lake massacre, was surrendered to Agent Flandreau and taken to Fort Ridgeley. While negotiating the surrender of two others held by the band, it was decided to suspend military operations planned, and which were to have been carried on mainly by the Tenth Infantry, under the command of Lieut.-Colonel Smith and Major Canby, until that object had been accomplished. Yellow Medicine Agency was the point from which the negotiations were being conducted.

Following closely upon the Indian troubles which most of the regiment had been employed, since early spring, in suppressing, came the necessity to send to Utah a large military force to protect the Federal officers there, and to compel obedience to the laws. Brigham Young, who had been running things successfully with a high hand for some years, finally announced himself as follows:

"I am, and will be Governor, and no power can hinder it until the Lord Almighty says, 'Brigham, you need not be Governor any longer.'"

This seems to have settled it. The Government ordered an expedition, consisting of two thousand five hundred men under Colonel A. S. Johnston, to Utah Territory for protection of the newly appointed Governor, Alfred Cumming, and other federal officials in the discharge of their duties.

The Tenth Infantry formed a part of the expedition, and by the 30th of June, 1857, the regiment, excepting A and D, was at Camp Walbach, near Fort Leavenworth. General Alexander, Colonel Smith, and Major Canby were present for duty; A was at that time at Fort Ripley, and D at Fort Ridgeley.

The regiment took up the march July 18 and reached Fort Kearney August 7 where it remained until the 11th, and on August 31 encamped eight miles below Fort Laramie, on the scene of Lieutenant Grattan's

massacre.* A left Fort Ripley July 8, and D Fort Ridgeley July 21, and at the end of August both companies were in camp near Fort Kearney, Neb., en route to Utah.

The march of the regiment from Fort Laramie was not resumed until Sept. 5, the time since its arrival having been occupied in refitting, replenishing supplies, and resting the weary. On the night of the 24th the Mormons made an attempt to stampede the mules of the baggage train, a small party of them dashing through the herd, firing and yelling. Only eleven of the mules were driven off, and they were recovered the next day by a party of teamsters sent in pursuit under Lieutenants Maynadier and Swayne. The regiment reached Green River on the 27th, left there at midnight the same night, and after a march of 23 miles reached Ham's Fork. Company C formed a part of the command of Captain R. B. Marcy during October. It returned to Ham's Fork October 31. A and D joined the command on the 6th of November.

The regiment arrived at Camp Scott, near Fort Bridger, on the 20th, where a winter camp was formed. The health of the regiment was reported remarkably good, but many cases of frost-bite occurred during the month. Theoretical and practical instruction was maintained as regularly as was permitted by inclement weather, and the absence of large details for detached guard and outpost duty, and the necessity of hauling all the fuel by hand four or five miles. These laborious duties were performed too, upon a restricted and indifferent allowance of food. The ration of flour was restricted at one time to ten ounces, and the beef cattle furnished were of the poorest quality, some of them unable to stand up.

The regiment moved from Camp Scott to Fort Bridger March 18, 1858, in one of the most terrible snowstorms ever encountered in that valley. It remained at this post until June 15, when it marched to Salt Lake City, arriving June 26, and at the temporary site of Camp Floyd, U. T., July 7, Major Canby, with E and K left Camp Floyd August 6 to proceed to Fort Bridger and there to assume command. Lieut.-Colonel Smith assumed command of the regiment August 6, Colonel Alexander going on leave, and the regiment moved from temporary to permanent site of Camp Floyd September 7, and at once commenced erecting adobe quarters into which it moved October 16, 1858.

It was during the year 1858 that the "double quick" was established as the habitual marching time of the regiment in the formation of line.

The duties which devolved upon the officers and men of the regiment at this period were extremely disagreeable, and demanded the utmost caution, determination, firmness and good judgment. The troops were employed in arresting and guarding civil prisoners, upon the requisitions of U. S. Marshals, and supporting officers at the U. S. Courts; Captain Heth, particularly, rendering efficient service in these duties. Company B, under Lieutenant Cunningham, was employed in protecting immigrants against Indians in the northern part of the territory, going as far north as Fort Hall.

Sergeant Ralph Pike, 10th Infantry, died at Camp Floyd, U. T., August

* Brevet 2d Lieut. John L. Grattan, 6th Infantry, killed in action with Indians Aug. 19, 1854.

14, 1859, and was buried with military honors on the 15th. He was a victim to Mormon hatred, having been assassinated in revenge for the proper discharge of his duty. It is of interest to know that the murderer of Sergeant Pike was arrested. The arrest, however, was not made until about twenty-eight years had elapsed, and it is not known what punishment, if any, the murderer received.

On March 21, 1860, the command of the regiment devolved upon Major Canby, Lieutenant-Colonel Smith having been directed to assume command of the department of Utah. Indian troubles in New Mexico occupied the attention of the military authorities early in this year (1860), the powerful Navajo tribe furnishing the greatest number of malcontents. Major Canby who stood high as an efficient and successful officer in the field, was directed by the War Department to proceed to Fort Garland, N. M., and on May 20 he, with A, F and H, left Camp Floyd en route for that post, which was reached after a long and arduous march of more than 640 miles, extending over a period of two months. The route selected was by way of Summit Camp on Salt Creek, Utah, where the command arrived May 31, and the Blue River, on which it encamped from June 28 until July 6, 1860, finally arriving at its new station, Fort Garland, July 28.

Regimental Headquarters, and B, C and G, under Captain Cumming, left Camp Floyd May 10 en route to Forts Bridger and Laramie, and reached Fort Bridger May 20. Headquarters, and C, D and K, under Captain Dunovant, left Bridger May 26, and arrived at Fort Laramie June 19, 1860, having marched a total distance of 550 miles.

Colonel Alexander rejoined from leave and took command of the regiment July 16, 1860, and on the same date appointed Lieutenant J. H. Hill, adjutant and Lieutenant L. H. Marshall, R. Q. M. Lieut.-Colonel Smith was relieved of the command of the department of Utah and assumed command of Camp Floyd August 20, 1860.

During the month of August, 1860, A left Fort Garland on an expedition against Navajo Indians and, on the 3d of October, had a sharp skirmish with a superior force of them in the Tunica Mountains, near the Sierra de las Estréllas, killing ten Indians, capturing five prisoners, taking 16 horses and destroying the village. First Sergeant Boyce was wounded in the affair by an arrow shot through his breast. The company then proceeded to Fort Defiance, A. T., arriving October 4, and leaving on the 11th as part of the first column of the Navajo expedition. On the last day of the month the company was in camp at Mesa de las Bacás, Lieutenant Rossell in command, having marched a distance during the month of over 300 miles.

During the first half of the month of November, A was employed in scouting the country between Cañon de Chele and Cañon de las Simitas.

Major Walker and Captain Dunovant, who were both from the South, resigned in December of this year.

Company A, with G, 5th Infantry, under command of Lieutenant Lewis, 5th Infantry, left Fort Fauntleroy January 5, 1861, on a scouting expedition. About thirty miles north of Fort Fauntleroy, on the morning of the 7th, a village was located, surprised by the troops, four Indians killed, seventeen taken prisoners, twelve animals captured, and the village destroyed. At

the commencement of the year 1862 the regiment was stationed as follows:

Headquarters and Companies D and K at Fort Laramie, Neb.; A and F at Socorro, N. M.; B, E, G and I in Washington, D. C.; C at Fort Wise, Col.; and H in camp at Pinos Ranch, near Santa Fé, N. M.

In January and early in February, A, F and H concentrated at Fort Craig, N. M., and on the 21st of February were engaged in the battle of Val Verde, near Fort Craig, with the rebel forces, F serving a battery of howitzers. The battalion commander, Capt. W. H. Rossell, 10th Infantry, was taken prisoner, ten enlisted men were killed and sixteen wounded in this engagement. The killed were Privates Collins, Hoggant, Miller, Reichling, Schweer and Washburne of Company A, and Corporals Crotty and Christianson, and Privates Brown and Schweep of Company H. This was the regiment's first sacrifice to the Civil War, made on the dreary plains of New Mexico, nearly two thousand miles from the principal theatre of operations.

Companies B, E, G and I, serving with the Army of the Potomac, left Washington, March, 1862,—encamped near Fort Monroe from March 26 till April 4,—and at Yorktown, Va., on the 12th. In May B was broken up and the men absorbed by E, G and I. The same course was adopted during the same month with A in New Mexico, the privates being transferred and the non-commissioned officers attached to F and H. During the previous month A, F and H had formed part of Colonel Canby's command, which left camp at Val Verde, N. M., on April 1, 1862, F serving as artillery. They took part in the affairs at Albuquerque on the 8th, and Peralto on the 15th of April. In September and October, 1862, C, F and H, marched to Leavenworth, arriving November 7. On the 24th they were in Washington, and four days later had reported for duty with the 2d Brig., 2d Div., 5th Corps, General Sykes commanding, at Aquia Creek, Va., where E, G and I were also serving. These six companies were engaged in the battle of Fredericksburg, Dec. 13, 14 and 15. E, G and I, while forming part of Sykes' Brigade, were engaged in the battle of Chickahominy, with a loss in killed and wounded of thirty enlisted men, and were engaged at Malvern Hill and Bull Run, 2d, with a loss in those two engagements of thirteen enlisted men. They were also engaged in the battle of Antietam, and in the action near Shepardstown, Va., with a loss in these two engagements of fifteen enlisted men.

The year 1863 proved to be a most eventful one for the regiment. At its commencement Headquarters and D and K were at Fort Kearney, having been transferred to that post from Fort Laramie in the preceding June. C, E, F, G, H and I were with the Army of the Potomac. Early in March, 1863, C, E, F and I were broken up, and the enlisted men, numbering 81, were transferred and attached to Companies G and H. Regimental Headquarters and D and K, commanded by Lieut. Bush, left Fort Kearney April 7, and joined the regiment in the field near Chancellorsville on the night of the 30th. When Lieut. Bush and his command, numbering three officers and fifty men, direct from the plains of Nebraska, joined the regiment, its total strength then amounted to but eight officers and 100 enlisted men.

At about noon of the following day, while moving toward Fredericks-

burg, the enemy made his appearance, and was attacked and driven back by the 2d Brigade, which on that morning led the division. When the enemy was first encountered the 2d Brigade was deployed with the 2d and 6th Infantry on the right of the road, the 7th, 10th, and 11th on the left. The 17th was deployed as skirmishers. The 10th, with some assistance from the 11th, captured in this advance 27 of the enemy, including one officer. Lieut. Bush commanded the regiment in this battle, and in his report recommends Sergeant-Major William Stanley for promotion to a second-lieutenancy for gallant conduct in the field. He also mentions national color bearer, Lance Sergeant J. A. Crotty for soldierly conduct and for capturing one of the enemy; and mentions Sergeant Michael Finaughty, regimental color bearer, for his coolness under fire.

The brigade commander in his report of the battle mentions Lieutenants Bush, Sellers, Kellogg and Boyce, 10th Infantry. Lieut. Sellers was at this time A.A.A.G. of the 2d Brigade,—Lieut. Kellogg, A.D.C.,—and Lieut. Boyce, A.A.D.C. to the brigade commander. Lieut. Hampson is also mentioned by the regimental commander for having distinguished himself in this action. The loss of the regiment in this engagement was 12 enlisted men wounded. On the 6th of May the regiment recrossed the Rappahannock and encamped near Falmouth, Va. In this month K was broken up and its 25 enlisted men were transferred and attached to D. The regiment, still forming a part of the 2d Brig., 2d Div., 5th Corps, left camp near Falmouth, Va., June 4, reached the vicinity of Gettysburg July 2d, and fought the enemy the same day, losing one officer—Lieut. W. J. Fisher—and 16 enlisted men killed; five officers and 27 men wounded, and three men missing. Captain William Clinton commanded the regiment at this time. The regiment lay in position, supporting a battery during the night of the 2d, and took part in the fighting on the 3d, 4th and 5th. The loss inflicted in these engagements upon what remained of the regiment at this time was fearful. Sixty per cent. of the officers, and over fifty-four per cent. of the enlisted men engaged were killed or wounded. The regiment occupied at one time an exposed position, with a greatly superior force in front and on both flanks. A terrific fire was directed against it by the enemy, and the roar of musketry was so great that the commands given it to fall back were not heard. Fortunately another portion of the Corps came to the rescue, and compelled the enemy to retreat. The wounded officers were Captains Clinton and Bush, and Lieuts. Welles, Boyce and Hamilton. Lieut. Boyce died shortly after from wounds received in this battle.

On the 8th of July the regiment was encamped near Middleton, Md. It crossed the South Mountain on the 9th, and arrived in camp near Williamsport on the 14th. On the 15th it crossed the Potomac at Berlin, and on the night of the 23d formed a part of the line of battle at Manassas.

The losses of the regiment had been so heavy, and it had become so reduced in point of numbers, that it had become necessary for the authorities to withdraw it from the field and send it North for recuperation. On the 17th of August what remained of it left Alexandria by steamer, arriving in New York City on the 20th, where it remained until the 14th of September, when it was transferred to Fort Lafayette, N. Y. H. At the end of the

year all that was left of the regiment consisted of the band and Company D, with a total strength, present and absent, of 128.

Capt. William G. Jones, 10th Infantry, while absent commanding, as colonel, the 36th Ohio Volunteers, was killed in the battle of Chickamauga, Ga., Sept. 19, 1863.

The regiment left Fort Lafayette on the 23d of April, 1864, and joined the 1st Brig., 1st Div., 9th Corps, near Bealton Station, Va., on the 29th of the same month. On the 6th of May it took part in the battle of the Wilderness, with a loss of eight enlisted men killed, one officer—Major Hayman—and 48 enlisted men wounded, and five men missing. On the 12th of May the regiment was engaged in the battle of Spottsylvania C. H., Va., losing but two men wounded.

From this time on until the battle of North Anna River, May 24, there was a total loss in killed, wounded and missing of 17 men. Casualties frequently occurred while employed in reconnoissances, picket duty and skirmishing. While making a reconnoissance near Spottsylvania C. H. on the 16th, one man was killed; and two days later, while on the same duty, two men were killed and one officer—Lieut. Reed—and one man were wounded. On the 3d of June the regiment was engaged in the battle of Cold Harbor, losing one officer—Lieut. Stanley, adjutant—and one man wounded. The regiment was transferred June 11 to the 1st Brig., 2d Div., 5th Corps, and took part in the battle of Petersburg, June 18, losing in killed and wounded three men. One man was killed on the 19th, and another on the 21st. On this date also Lieut. Skinner was wounded, from the effects of which he died June 26.

The regiment also took part in the assault following the explosion of the mine at Petersburg, July 30. It was also engaged in the battle of Weldon Railroad, August 18, 19 and 21, 1864, losing six men killed, one officer—Captain R. H. Hall—and nine men wounded, and one officer—Lieut. J. C. White—and sixteen men missing. The movement of the regiment to its position of the first day at Weldon Railroad began at daylight on the 18th. The march was a most fatiguing one, the heat intense. Lieutenant Luning, commanding, was prostrated about noon from its effects, and the command then devolved upon 2d Lieut. T. H. French. Fully one-third of the men had fallen out of ranks before this time from sheer exhaustion, although they bravely endeavored to keep up. In the first advance, which was made through a dense wood east of the railroad, and half a mile beyond, the regiment was engaged, outflanked, and subjected to a heavy cross-fire, which caused it to fall back to a position in the rear of the woods. Captain Hall joined the regiment on the morning of the 19th. At about 3 o'clock on the afternoon of that day the enemy again attacked the line of which the regiment formed a part, again outflanked it, and caused it to withdraw. It subsequently regained its first line after a gallant charge against the enemy. Captain R. H. Hall, commanding the regiment, was hit by a musket ball in the head a few hours after taking command.

On the 20th there was no fighting for the regiment, but on the 21st it occupied a position greatly exposed to an artillery cross-fire. The fire was so well directed that our men had to seek safety on the *outside* of their breast-

works. 1st Sergeant Pealock received special mention for his gallant conduct, coolness and bravery, during these engagements of the 18th, 19th and 21st of August.

On the 1st of October the regiment, still forming a part of the 1st Brig., 2d Div., 5th Corps, was engaged in battle on the Squirrel Level Road, Va., losing three men, killed, and one officer—Lieut. T. H. French—and five men wounded, and 18 men missing. The regiment was commanded in this battle by 2d Lieut. Theodore Schwan, who, in his report, mentions Lieutenants French and Hunter as having behaved with gallantry seldom surpassed. 1st Sergeant Pealock is again mentioned for coolness and bravery. Corporal H. Marshall, 1st Sergeant Marpool, and Privates Stephens, Steward, Landan and Mahony are also noticed for noticeable coolness under fire.

On the 12th of October the regiment was detailed as provost guard at Headquarters 2d Div., 5th Corps, and on the 25th was ordered to Fort Hamilton, N. Y. H., where it arrived on the 29th. It was transferred to Fort Columbus, N. Y. H., November 3d, and to Fort Porter, Buffalo, N. Y., December 2d, where it was stationed at the end of the year. It was much depleted in numbers, mustering, present and absent, but 189, a large portion of the absent sick being permanently disabled.

In March, 1865, 245 recruits were sent to the regiment, certain companies were reorganized, and were all filled to the maximum strength. In April 170 recruits were received and Company G was reorganized.

The regiment was again ordered into the field in April, 1865, and reached Headquarters Army of the Potomac April 23d, at Burksville, Va. It marched with that army, via Richmond, May 6th, and encamped at Arlington Heights May 12th. It participated in the review of the Army of the Potomac May 23d, at Washington.

On the 20th of October the regiment moved by rail to St. Louis, Mo., arriving October 27th, and on the 31st Companies A, B, D, F, G and H moved by steamer up the Mississippi River to St. Paul, Minn., and were stationed as follows: Companies D and F at Fort Snelling; B and H at Fort Ridgely, and A and G at Fort Ripley, Minn.; Regimental Headquarters were established at Jefferson Barracks, Mo. In December, 1865, C, E, I and K were reorganized at the General Recruiting Depot, Fort Columbus, N. Y. H., and in April, 1866, together with Regimental Headquarters, joined the regiment at Fort Snelling.

A redistribution to posts took place, and early in June, 1866, the regiment was stationed as follows: Headquarters and Company B at Fort Snelling; H at Fort Ridgely; A and I at Fort Ripley; D and F at Fort Abercrombie, D. T.; C, E, G and K at Fort Wadsworth, D. T.

After the arrival of the regiment in Minnesota, it was employed in repairing and rebuilding, and in procuring fuel, so that but little work was possible toward instructing and drilling the new men.

In June, 1867, Company C, with detachments from D and F, acted as mounted escort to the department commander, and while encamped near Fort Stevenson a party of hostile Indians stampeded the horses belonging to the escort, and succeeded in running off several. The Indians were im-

mediately pursued, soon overtaken, and in the skirmish which ensued Private Wallace was wounded. During the summer G and H were busily employed in building the post of Fort Ransom.

In 1869 the regiment was transferred to the Department of Texas, and by the end of July the assignments to stations had been completed. By the end of August, 1869, the consolidation of the regiment with the 26th Infantry had also been effected, at which time the regiment was stationed as follows: Headquarters and A, H and K, at Fort Brown, Texas; E and I at Ringgold Barracks; B at Corpus Christi; C at Fort McIntosh; D at Galveston; F at San Antonio, and G at Helena, Texas.

During its stay of ten years in the Department of Texas the regiment was engaged in a constant series of scouting and Indian fighting expeditions of more or less importance, some of them extending even into Old Mexico.

The causes which combined to bring about the frequent expeditions organized for field service during the years 1866-67-68 had their origin mainly in the comfort, aid and security extended the Indians by the Mexicans on their side of the river. The Lipans, a tribe small in numbers but active as monkeys, and as bold and cunning as Comanches, had established themselves near the towns of Zaragoza and Remilina, in the State of Coahuila, from which points they usually started on their destructive raids into Texas. In 1876 Colonel Shafter with a large command crossed the Rio Grande, hunted up the hostile villages, wiped two or three of them from the face of the earth and killed a number of their most active warriors. This had the effect of keeping the survivors of the tribe quiet for a few months, by which time they had effected something in the way of a combination with the Mescalero Apaches, when they again became troublesome, but the troops followed them up so closely that their raids to our side of the river soon practically ceased and the redoubtable little band of Lipans rather mysteriously disappeared from view. But it is not at all unlikely that many of them can now be found among their old allies the Mescalero Apaches on their reservation near Fort Stanton, N. M.

In 1878 raids by the Indians from Coahuila had become a thing of the past, but early in that year a large expedition was organized, commanded by General Mackenzie, and Mexico was again invaded by our troops. This time however, the Mexican military authorities made a pretence of opposing the American forces and established themselves in a strongly defensive position on the crest of the eastern slope of the Remilina Creek, a rapid stream, which was about four feet deep opposite their lines.

The 10th Infantry battalion, under the command of Capt. W. C. Kellogg, was directed to advance against the enemy which was done in double time, the creek was reached and the crossing found very difficult owing to the swiftness of the current, but when the battalion had emerged from the creek and had ascended the opposite slope, not a white coated Mexican soldier could be seen. The rapidity of their flight could only be equalled by that of a flock of mallards. Not a shot was fired by either side. The other battalions, which were composed of troops from the 20th, 24th and 25th Infantry, 2d Artillery, 4th, 8th and 10th Cavalry, in all about 1000 men, stood silently by in column, apparently wondering what it all meant and what the

trick was anyhow. In the Department of Texas this affair was frequently mentioned and never without exciting derisive remarks and much amusement. It has been termed the battle of Remilina.

The field operations of the 10th Infantry for the years from 1872 to 1879 involved no small amount of extremely severe labor. The young officers of the regiment were almost constantly in the field serving with the scouts or cavalry when their own companies were in garrison. This was occasioned mainly by a scarcity of officers throughout the Department. Many were disabled, awaiting retirement, and others were on detached service.

Good fortune was in store for the regiment, however, for in May, 1879, it was transferred to the Department of the East, arriving in Detroit, May 27, 1879. It was stationed as follows: Headquarters and A, E, H and K at Fort Wayne; B and I at Fort Brady; C and D at Fort Mackinac, and F and G at Fort Porter, N. Y.

During its stay of five years in this Department nothing of general interest occurred except perhaps the participation of Regimental Headquarters and A, D, F and H, in the centennial celebration at Yorktown, Va., in October, 1881.

In June, 1884, the regiment was transferred to the Department of the Missouri, taking stations as follows: Headquarters and B, C, F and I, at Fort Union, N. M.; D. and H at Fort Bliss, Texas; A and E at Fort Lyon, Colorado; and G and K at Fort Crawford, Colorado.

On the 16th of March, 1885, Captain Kirkman, Lieutenant Seyburn and twenty enlisted men proceeded from their station, Fort Union, to Springer, the county seat of Colfax County, N. M., to prevent, if possible, a collision between the civil authorities and outlaws. The command arrived in the town at night, raised the siege of the court-house which was being conducted by the excited outlaws and cowboys, and rescued the civil officers who had taken refuge in the building. In this affair the celebrated Dick Rogers lost his life, as did one of the Currys and "Red River Tom," all presumably at the hands of one man, a deputy sheriff by the name of Jesse Lee. The soldiers escorted the officials to Las Vegas for safe keeping and then returned to Fort Union.

Companies C, D, F, H and I, took part in the campaign against the hostile Chiricahua Apaches under Geronimo, in 1885-86, F and I being out from July, 1885, until the end of August, 1886.

On the 19th of April, 1889, an expedition commanded by Lieutenant-Colonel Simon Snyder, 10th Infantry, consisting of G and K, 10th Infantry, and K and G, 18th Infantry, left Fort Lyon, Col., for Oklahoma, I. T. The object of this expedition was to aid in preserving the peace among the people upon the opening of Oklahoma Territory. The President's proclamation opening it to settlement went into effect at noon on the 22d of April, at which time great numbers of people poured in from all directions. There was entire absence of law. Extreme disorder prevailed, and the duties of the troops in preventing bloodshed were difficult and demanded good judgment, patience and skill.

The regiment is stationed at the present time (January, 1891) as follows: Headquarters and Company D at Fort Marcy, N. M.; C and H at Fort

Union, N. M.; B at Fort Stanton, N. M.; A and F at Fort Leavenworth, Kansas; E at Fort Lewis, Col.; and C at Oklahoma, I. T. I and K, skeletonized.

It is noticeable how frequently the regiment has occupied the same stations. In 1855 a portion of it garrisoned Fort Snelling, Minn., and again in 1866. In 1861 portions of the regiment were stationed at Forts Union, Marcy and Lyon, and again, twenty-nine years later, these posts were occupied by a part of the 10th Infantry. In 1865 it was at Fort Porter, N. Y. In 1879 and until May, 1884, Companies F and G composed the regular garrison of that post.

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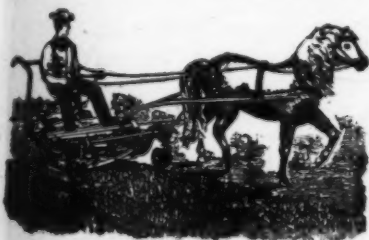
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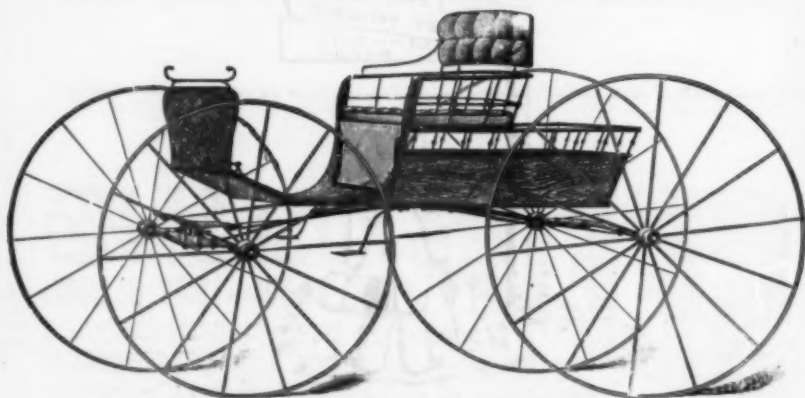
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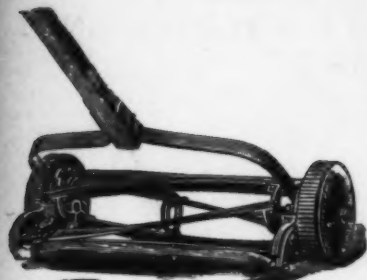
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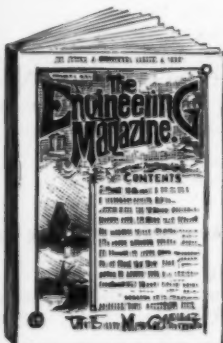
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